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A Critical Study of the Slime-Molds of Ontario

BY

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A CRITICAL STUDY OF THE SLIME-MOLDS OF ONTARIO.

MARY E. CURRIE, M.A.

The Myxomycetes are a group of plants found in practically every country where they have been looked for, the world over. So many species are cosmopolitan that it seems quite possible that further study and collecting will prove most of them to be of world wide occurrence. No extensive study has been made of our Canadian species. A paper written by Professor C. L. Moore (Trans. N.S. Inst. of Sc., Vol. XII, p. 165) "The Myxomycetes of Pictou Co." lists thirty-six species and varieties. Two of these, *Licea variabilis* Schrad. and *Margarita metallica* Lister, we have not found in Ontario. W. N. Cheesman records 36 species from the Canadian Rocky Mountains in "A contribution to the Mycologic flora and the Mycetozoa of the Rocky Mountains" (Trans. Brit. Myc. Soc. III, 4, p. 267-276, 1911). Mr. J. W. Eastham published a preliminary list of 40 species and varieties in "The Ottawa Naturalist", February 1912, "The Myxomycetes or Slime-Moulds of the Ottawa District; a preliminary List". The material on which he based his article was a collection of Myxomycetes which he obtained during a year's sojourn at Ottawa. The only other Canadian list which I have found is given in a chapter written by Professor J. H. Faull in "The Natural History of the Toronto Region"; 61 species and varieties are recorded. In addition to these three papers which are, I believe, the only ones which have dealt exclusively with Canadian forms, Professor Macbride in his exhaustive study of American forms, "North American Slime-Moulds", includes a Canadian record for 25 of the 220 species of his manual.

The present paper is based on a critical study of the collections of myxomycetes in the Herbarium of the University of Toronto. The majority included here were collected mainly in the Lake Ontario region, but a few come from other parts of Ontario. An occasional reference is made to other interesting specimens stored in the herbarium. In all, 29 genera of 118 species and varieties are represented. The studies establish a working acquaintance with the members of this group and, aside from a contribution to the distribution of the slime-molds and an interpretation of our own flora, were preparatory to investigations on the parasitism manifested by certain species.

Various works and special articles have been consulted in the preparation of the article, but I am especially indebted to Macbride's "North American Slime-Moulds" and to Lister's second edition of the "Mycetozoa".

This paper represents the systematic part of the work done on the slime-molds in the Botanical Laboratories of the University of Toronto. Further contributions on certain of the parasitic species of this group will follow. These studies were made during the tenure of an open fellowship under the direction of Professor J. H. Faull to whom I wish to acknowledge my gratitude for advice and assistance. Thanks are also due to Professor Macbride and Dr. Sturgis for their opinions concerning certain specimens submitted to them for examination.

AMAUROCHAETE FULIGINOSA Macbr., N. Am. Slime-Moulds, p. 109, 1899.

This species which Macbride states as common in Europe and probably not uncommon in this country wherever pine forests occur, Professor J. H. Faull reports as common in the pine forests of northern Ontario. No. 2887 is entirely typical, and consists of 3 aethalia, two 2 cm. in diameter, and the other 1.5 cm. There is a shining black deciduous peridium, a ragged black capillitium and spores soft dusky black in a mass, slightly paler on one side, with minute dark warts, 11.7 to 13μ in diameter.*

No. 5176 is an unusual gathering because in it the individual sporangia do not wholly lose their identity in the mature aethalium. Their convex apices give to the surface of the aethalium an appearance similar to that of a raspberry. The capillitium consists of ragged strand-like columellae which branch into a regular-meshed net of smooth purple-brown threads beset with sharp short branches and with expansions at the angles of the net. The spores measure up to 15μ and are typical. This specimen was collected during a period of great humidity. In both specimens there is a well-developed shining purplish-black hypothallus.

On white pine trunks. Temagami Forest Reserve.

Nos. 2887, 5176, 2380T†.

ARCYRIA CINEREA (Bull.) Pers., Syn. Fung., p. 184, 1801.

This species although unmistakable and easily recognized has a wide range of variation. The stalked oblong or nearly globose fruits are smoke grey (R)† to avellanous (R) in colour and vary in height from 2 to 6 mm. They may be scattered over the substratum or clustered in groups of from 2 to 10, the confluent stalks forming a single stipe.

*T = A collection of slime-molds mainly from Europe made by Professor C. Torrend.

†R = Ridgway's "Color Standards and Color Nomenclature", Washington, 1912.

Macbride divides the species into two, *A. cinerea* (Bull.) Pers. and *A. digitata* (Schw.) Rost. The former he distinguishes by scattered or gregarious small fruits, the latter by large compound fruits. We have gatherings of both these forms but also have gatherings of the small form which has compound as well as solitary sporangia, which makes the separation of our Ontario collections into two species impossible. The capillitium may consist of coarse or fine threads which are broader towards the centre of the fruit and become finer towards the outside. The fine exterior threads in some of the larger fruits form a *Stemonitis*-like network.

On dead wood, bark, roots and leaves. Swansea; Toronto; Niagara Glen; Rideau Lake; St. Andrews, N.B.; Ithaca, N.Y.; Bedford, Mass.; Spruce Creek, Penna. Nos. 2134, 2135, 2141, 2142, 2143, 2209, 2301, 2302, 2381T, 2589, 2590, 2591, 2680, 2883, 2884, 2885, 2886, 2904.

ARCYRIA DENUDATA Sheldon, Minn. Bot. Studies, I: 470. 1895.

This species is one of the commonest of our Canadian myxomycetes. It is closely related to *A. incarnata* Pers. and *A stipata* Lister—so closely that Sturgis in his "Myxomycetes of Colorado" states that it is "hardly more than a variety" of *A. incarnata*. We find it occurring in Ontario, a distinct species with well-marked features. It differs from *A. incarnata* Pers. and *A. stipata* Lister by having the capillitium firmly attached to the cup. The pale red cups are coarsely warted, the bases of the warts forming meshes that give the appearance of a reticulation. Sometimes there are a few coarse dark-red warts or spines scattered along the plaits on the outer surface of the cup. The threads of the capillitium, although they show many variations, are always sculptured by cogs and half rings in a spiral. The threads may be wide or narrow, the spiral may be loosely wound or so tightly that it is difficult to distinguish. The sculpturing is often more pronounced in the upper threads than in the basal ones. In our specimens the threads are beset with tiny spines in addition to the spiral of cogs and half rings.

On rotten oak logs, punk and bark. Toronto; Beaverton; York Mills; Meaford; Go-Home Bay; Muskoka; Rideau Lake; Niagara Glen; Ithaca, N.Y.; Spruce Creek, Penna.; Ottawa.; Long Island, N.Y.

Nos. 2137, 2139, 2140, 2148, 2149, 2197, 2232, 2289, 2303, 2344., 2348, 2683, 2594, 2682, 2684, 2685, 2687, 2153, 2138, 2592, 2389T, 2532, 2595, 2596, 2592, 2597, 2593, 2876, 2877, 2878, 2879, 2880, 2881, 2882.

ARCYRIA FERRUGINEA Sauter, Flora XXIV: 316. 1841.

This is a rare species but one that forms conspicuous patches of Dragon's Blood Red (R) closely-crowded sporangia on stumps of old

trees or on fallen twigs in pine woods. The round-meshed reticulated inner surface of the sporangium cup is one of the features which distinguishes it from the closely allied *A. vitellina* Phillips. Macbride states that the inner surface is smooth but that is not the case with any of our specimens, except the abnormal one mentioned. In respect to the inner reticulation, our plants correspond exactly with those described by Lister and with European material in our herbarium. One of our gatherings No. 2599 varies somewhat from the type. The cup is wrinkled transversely but otherwise is nearly smooth. The threads of this specimen answer to the description given by Lister of an abnormal form found by Professor Schinz in Switzerland. They "are beaded at short intervals with globular or ovoid swellings 10μ thick which are marked with a close reticulation of raised bands; the threads between the swellings are nearly smooth".

On dead wood. High Park, Toronto.

Nos. 2598, 2599, 2875, 2382T.

ARCYRIA GLOBOSA Schwein, Syn. Fung. Carol., p. 38. 1822.

This species has small stalked pale-yellow globose sporangia usually found scattered on the spines of chestnut burs. Macroscopically it is very similar to a *Physarum* and even at maturity the capillitium is so inelastic that it is easily confused with the persistent globose capillitium of a *Physarum*. Its features are remarkably constant; the only variation found amongst our specimens is the number of free clavate ends. Sometimes there are a great many or there may be only two or three.

On chestnut burs. Toronto; Spruce Creek, Penna.; Ithaca, N.Y.

Nos. 2136, 2233, 2369, 2549 F.C.,* 2587.

ARCYRIA INCARNATA Pers., Obs. Myc., I, 58: T. v, figs. 4-5. 1796.

This feathery rosy-red species is closely allied to *A. denudata* Sheld., but is distinguished from it chiefly by the weak attachment of the capillitium to the cup. The pale-red cup is strongly spinulose and dark-red warts or spines on the exterior of the cup, that are found only occasionally in *A. denudata*, are always present. The threads of the capillitium are elastic, about 3μ in diameter, and are sculptured by a spiral of thin but wide half rings which are so drawn out as to seem like long spines. Lister lays emphasis on the occurrence of many free ends. Our specimens are typical *A. incarnata* Pers., but there are few free ends.

On dead wood. Toronto; Muskoka; High Park; Niagara Glen; Rideau Lake; St. Andrews, N.B.; Meaford.

Nos. 2150, 2165, 2224, 2265, 2314, 2322, 2383T, 2531, 2681, 2688, 2871, 2872, 2873, 2874.

*F.C. = Fungi Columbiani.

ARCYRIA NUTANS Grev., Fl. Edin., p. 455. 1824.

When mature, this abundant species forms conspicuous yellow woolly masses due to the long expanded drooping capillitium. The colour varies from pale lemon (R) to orange yellow. The wind soon blows away the light capillitium and leaves the empty yellow goblet-like cups. The pale cup is sometimes coarsely reticulated, sometimes strongly spinulose. The capillitium shows little variation. The threads in our gatherings have many free ends.

On old oak and pine stumps and bark. Toronto; High Park; Muskoka; Niagara Glen; Ottawa; Temagami.

Nos. 2145, 2146, 2212, 2312, 2317, 2347, 2357, 2361, 2385T, 2868, 2869, 2870.

ARCYRIA OERSTEDTII Rost., Mon., p. 278. 1875.

This species is at once distinguishable from *Arcyria nutans* Grev. which it resembles in habit, by its reddish colour and more delicate capillitium. It occurs in dense red masses of crowded cylindrical sporangia, 3 to 4 mm. in height, on tiny weak stalks. When the peridia break, the elastic capillitium expands into a drooping feathery Hay's russet (R) mass. Macbride found these plume-like fruits 6 mm. long, but in collection No. 2867 they are 12 mm. or more. Lister emphasizes the presence of persistent fragments of the sporangium-wall adherent to the capillitium after the rupture of the sporangia. In collection No. 2867 an occasional persistent bit of peridium can be found but in none of our gatherings was this a constant feature. Sturgis made the same observation ("New and Rare Myxomycetes" Mycologia, 1917) for Colorado specimens. The pale-red cup is very spinulose with the bases of the spinules running together to form a pseudo-reticulation. The capillitium is characteristic. The threads vary from 2.6 to 4μ in diameter, and are densely beset by tiny spines which may or may not be arranged in a spiral. The threads do not branch frequently; when they do there are perforations in the axils. The colour of the fruits fades from red to brown with age.

On dead wood. York Mills; Niagara Glen; Ottawa.

Nos. 2147, 2386T, 2866, 2867.

ARCYRIA POMIFORMIS Rost., Mon., p. 271. 1875.

A single scanty gathering of this species is from Ottawa. The old-gold (R) scattered sporangia are typical. The compact capillitium consists of much branched threads, 2-4μ in diameter, some of which are quite smooth, others have a faint sculpture of small spines and a fine reticulation. Its colour distinguishes it from *A. cinerea* Pers. to which it

is closely related. A comparison of our material with a European specimen from Torrend leaves no doubt as to its identity.

Ottawa.

Nos. 2866, 2387T.

ARCYRIA STIPATA Lister, Mycetozoa, p. 189. 1894.

This species may be recognized by its peculiar habit. The closely aggregated copper-coloured sporangia are so compactly crowded together that the sporangia are twisted and pressed into irregular shapes. The fruits have weak inconspicuous stalks that make them appear sessile. The cup on its inner surface may be roughly papillate with a suggestion of fan tracery, or reticulate. The threads are beset with many coarse blunt spines, or cogs arranged in a loose spiral, and in addition have a *Hemitrichia*-like spiral marking which is more or less distinct. Owing to this spiral Macbride considered the species a *Hemitrichia*, and indeed it is a possible connecting link between the *Arcyrias* and the *Hemitrichias*, so it is a matter of personal preference whether it is placed in the one or the other of these genera. The *Hemitrichia*-like spirals are usually more distinct in the basal threads where there are fewer spines, and the spines and cogs are more pronounced elsewhere.

On dead wood. Don Valley; Swansea; Toronto; Algonquin Park; Port Credit; Lambton Mills; Beaverton.

Nos. 2128, 2129, 2130, 2131, 2132, 2194, 2259, 2686, 2865.

ARCYRIA VITELLINA Phillips, Fungi of California and the Sierra Nevada Mountains, Grev. V, p. 115. 1877.

The pyriform shortly-stalked cinnamon-rufous (R) sporangia of this species are crowded in patches about 1.5 cm. in diameter on the substratum. The sporangium-wall is peculiarly marked on its inner face with what appear to be half reticulations and half papillate warts. Our plants are typical. They are clearly *A. versicolor* Phillips as defined by Lister, but Lister's conclusion that *A. vitellina* Phillips and *A. versicolor* Phillips are the same form warrants giving the name *A. vitellina* P. preference for reasons given by Sturgis in his "Myxomycetes of Colorado". It is a rare form in the east, although not infrequent in the far west, and has not been reported previously from Canada.

On dead wood. Toronto.

No. 2356.

BADHAMIA FOLIICOLA Lister, Journ. Bot., XXXV: 209. 1897.

This species which is found not infrequently in Europe has not been reported previously from America. The sporangia are sessile and sub-

globose, scattered over the substratum with the bases of the thin iridescent peridia persistent after spore dispersal. The capillitium is a network of slender strands, aggregated in the centre to form a pseudocolumella with varying amounts of lime deposits. The spores are chestnut brown (R) coarsely warted and with no pale area of dehiscence. We have three specimens of the species in the herbarium. One of these, No. 2390, on an old bit of straw is from Portugal. Another, No. 2271, was found by Professor Faull at the base of a Norway spruce in Prince Edward County, Ontario. It has fruited on a lichen which was growing on the bark and on which the myxomycete apparently had been feeding. These two specimens have small fruits 0.5 mm. in diameter. Their spores are spinulose, 10.5μ in diameter, and free, with no tendency to cluster. The other specimen is of especial interest. It was found by Mr. A. W. McCallum in the late autumn, November 1st, of 1918, at the Rifle Ranges near Toronto, in the plasmodial stage. A bright yellow plasmodium was creeping and feeding upon fruits of *Polyporus resinosus*. One bracket whose pore surface was covered with it was brought to the laboratory and placed in a petri-dish. Within the next few days after creeping to the upper surface of the fungus it migrated to the bark and partly on it, partly on the filter paper at the bottom of the dish, heaped up and formed the subglobose sessile fruits. Some fruits are 0.5 mm. in diameter, as those of the other specimens, but there are all gradations in size to 1.5 mm. in diameter. The spores are large, 13μ in diameter, minutely spinulose, and show a decided tendency to cluster in groups of from 3 to 10. It has been cultured continuously since the time of collecting. Lister quotes 0.5 to 1 mm. in diameter for the size of sporangia and 9 to 11μ in diameter for the spores and says the spores sometimes show a slight tendency to adhere in loose clusters.

This is another species added to the list of the myxomycetes which parasitize fungi.

One of our specimens has larger sporangia and larger spores than any one previously reported and clustering of the spores is a pronounced feature.

On lichen, effused fungi, and dead wood. Prince Edward County. Nos. 2271, 2390T, 2911, 2914.

BADHAMIA LILACINA Rost., Versuch, p. 10. 1873.

A perfect gathering of this beautiful species was made by Mr. W. G. Scrimgeour in July, 1908, at Snelgrove, Ontario. The sporangia are densely crowded, covering twigs, leaves and sphagnum moss. Their bases are deeply coloured and frequently show a slight tendency to form

stalks—a feature that is said to occur rarely in this species. The spores are absolutely distinctive, with their confluent warts and ridges. This appears to be an eastern form, since it has not been reported west of the Mississippi. It is said to be common in the eastern United States, but so far it is very rare in Ontario.

On twigs, dead leaves, sphagnum. Snelgrove.

No. 2245.

BADHAMIA MAGNA Peck, Rep. New York Mus., XXXI: 57. 1879.

Our four specimens of this species show no variation from the type described by Peck and later by Lister. The clustered globose grey sporangia on their long weak membranous stalks rarely exceed 0.5 mm. in diameter. The spores are light seal-brown (R), 10μ in diameter, very finely spinulose, with a pale smoother area of dehiscence, and are never clustered. It is of interest to note that Peck found *B. magna* Pk. "on some effete Polyporus and wood impregnated with its mycelium". All our specimens are on bark. A light-cadmium (R) plasmodium was obtained by sowing spores of No. 2864 on nutrient agar which was kept in culture in the laboratory for several months. This is the first record of the plasmodium.

Ottawa; Toronto.

Nos. 2251, 2600, 2601, 2864.

BADHAMIA RUBIGINOSA Rost., Mon., App., p. 5, fig. 115. 1896.

This *Craterium*-like *Badhamia* is said to be widely distributed in North America. In our collection are several handsome specimens which have multitudes of lilac-pink or rufous to purplish-brown sporangia covering leaves, twigs and dead wood. The fruits may occur singly or be grouped in clusters of from 2 to 15. Sometimes, when clustered, the stalks are ribbon-like and confluent. These stalks are glossy, reddish brown as in No. 2002, or they may be any shade from purplish brown to dark purple, and they are filled with clear crystalline lime nodules. They arise from a purplish-brown membranous hypothallus which sometimes is small and radiant as in No. 2862, but which is usually extensive, common to all the fruits as in No. 2863. Continued within the sporangia the apices of the stalks form the pale- or dark-colored columellae characteristic of the species. The dark purple-brown spores are minutely spinulose 12 to 14μ in diameter. In No. 2002 the spinules are so indistinct that the spores appear almost smooth. The spores are often ridged as a result of compression.

On twigs, dead leaves and dead wood. Toronto; Ithaca, N.Y.; Bedford, Mass.; Rideau Lake

Nos. 2001, 2002, 2861, 2862, 2863.

Badhamia utricularis Berk., Trans. Linn. Soc., XXI: 153. 1852.

This species is the commonest of the *Badhamias* and is widely known for its habit of creeping over and consuming certain fungi. Lister finds the "plasmodium extensively creeping over the bark of fallen trees, logs, etc., feeding on effused fungi especially *Stereum hirsutum* and *Polyporus versicolor*". In this district it has a preference for *Polyporus resinosus*, which constitutes the substratum of five out of six collections in the herbarium of the University of Toronto. In one of these collections the sporophore of *P. resinosus* consists of eight subimbricate laterally connate brackets, the largest 16 cms. wide and the smallest 8 cms.; the entire fructification is covered with a magnificent colony of the typical grey clustered iridescent sporangia of *B. utricularis*. There are comparatively few sporangia on the upper surface of the brackets, and these have slender, branched, straw-coloured, thread-like stalks that recline on the substratum, but the sporangia are densely massed on the lower surfaces and are pendulous on slightly longer and stronger stalks than those above. The plasmodium has effected no apparent change on the upper surface of the brackets but the lower surfaces are furrowed throughout, and the pores wholly destroyed.

The history of collection No. 2352 is of especial interest by way of comparison with the account just given of *B. foliicola*. This particular specimen was brought to the laboratory in the plasmodial stage on the usual host, *P. resinosus*, and after a few days it fruited forming typical stalked sporangia.

The plasmodia form sclerotia quite readily and these are of a shiny brick colour.

The species shows constant well-marked characteristics. The sporangia are blue grey, iridescent, ovoid or pear shaped, on slender weak, straw-coloured stalks. At maturity the spores are soon dispersed, leaving the dainty feathery, greyish-white, ragged-edged, goblet-shaped cups formed by the persistent peridia. The spores are pale burnt amber (R), globular, averaging about 11.5μ in diameter, with evenly distributed coarse dark warts, 11-13 across the spore diameter. These are not smaller nor are the spores paler on one side more than on the other. The spores are clustered in groups of from 4 to 17, but readily separate from one another. On comparison with a Torrend specimen our gatherings are found to possess all characteristics in common with the European gathering.

Some confusion exists with regard to the interpretation of *B. utricularis* Berk. and two closely allied species, *B. capsulifera* Berk. and *B magna* Peck, the interpretation being based largely on spore characters

Lister distinguishes these as follows: *B. utricularis* Berk., spores clustered though in varying degree, equally warted all over, 11-13μ in diameter, large plasmodia; *B. capsulifera* Berk., spores clustered, warted chiefly on one side, 9 to 12μ in diameter, small plasmodia; *B. magna* Peck, spores not clustered, nearly smooth, blackish with a paler smoother area of dehiscence, 9 to 10μ in diameter, plasmodium (?). Massee avoids trouble by throwing all three species into one, *B. varia* Mass. Macbride in his "North Am. Slime-Moulds" agrees with Lister in regard to *B. capsulifera*, but defines *B. magna* as probably synonymous with it. It is difficult to understand how he arrives at this conclusion, for in *B. capsulifera* there is general agreement that the spores are clustered, while for *B. magna* Peck makes no mention of clustering and Lister who figures and redescribes Peck's species, finds the spores free. Macbride differs from Lister in his definition of *B. utricularis* Berk., "spores not strictly adherent though not without some tendency to stick together". But this difference of opinion may be more apparent than real, for while Lister emphasizes the clustering of the spores he finds that they are sometimes comparatively free; Macbride sees the loose spores first but grants that they often show a tendency to adhere. My observations on the specimens found in Ontario confirm Lister's interpretation of the three species.

On dead wood, moss, and *Polyporus resinosus*. Toronto; Port Credit; York Mills; High Park, Toronto; Prince Edward Island.

Nos. 2352, 2260, 2294, 2860, 2394T, 2395T.

BREFELDIA MAXIMA Rost., Versuch, p. 8. 1873.

Many magnificent collections of this rare species have been made from the neighbourhood of Toronto. Several were first observed in the plasmodial stage—the large white plasmodia with a bluish tinge are conspicuous objects. One of these formed a cushion-shaped aethalium about 8 inches across on a persistent and more widely extending hypothallus. At the border of the aethalium are numerous individual sporangia. Another gathering included two fructifications, both on the same hardwood stump, one about 50 cms. in length, the other about 60 cms. The plasmodia of these, after being first observed, traversed a distance of about three feet. This is the largest of the slime-molds and is readily recognized by its size, its flat aethalium, and purplish-black colour.

On dead hard wood. Rifle Ranges, Toronto; York Mills; Toronto.

No. 2276.

Ceratiomyxa arbuscula Berk. and Br. Journ. Linn. Soc., XIV: 97. 1873.

This species may easily be confused with delicate filiform specimens of *C. fruticulosa*, but clearly differs with respect to branching. Macbride makes no reference to this form at all; Lister refers to it as *C. fruticulosa* var. *flexuosa*; Massee follows Berkeley and Brown in regarding it as a distinct species. It occurs in dense mat-like patches on rotten wood, often pure white to pinkish buff (R). Each sporophore has a single pale brownish-coloured stalk with a profusely branching tree-like top, the terminal branches of which are closely intermingled but not anastomosed with those of neighbouring fruits. The stalk may be short and pale but is always present and the other features are very constant. Massee affirms that one of the differences between *C. fruticulosa* and *C. arbuscula* is that in the latter "the thin outgrowth bearing the spore at the apex is much larger than in *C. fruticulosa*", and "the septum is even more distinct". On examination the outgrowths or sterigmata of all our specimens are found to be slender, 13—17μ in length with bases 1.5μ in diameter. This size is the same as that for the filiform fruits of *C. fruticulosa*—the smaller of the two extremes found in that species—so no importance may be attached to this feature. The spores measure 10.5×6.5μ, similar to those of the other species in the genus.

I have seen no intermediate condition between *C. arbuscula* and *C. fruticulosa*.

On dead wood. Foster's Flats, Niagara; Toronto; Rideau Lake. Nos. 2359, 2530, 2602, 2603.

Ceratiomyxa fruticulosa (Muell.) Macbr., N. Am. Slime-Moulds, p. 18 1899.

This is one of the commonest and most widely distributed of our slime-molds. It always occurs on rotten wood and frequently forms patches many square inches or even square feet in extent. When mature if it is disturbed clouds of oval translucent spores are given off. The prevalent colour is white, but occasionally gatherings are cream coloured, pale ochraceous buff (R), or more rarely still Baryta yellow (R) as in No. 2398, a specimen collected by Professor Torrend in Bresil, Portugal. The species is characterised by its cespitose, finger-like or columnar fruits which rarely fork and more rarely anastomose over the substratum. The collections differ as to the size of their sporophores: some have long or short delicate unbranched filiform fruits, some short stout ones.

There are two types of sterigmata; slender ones, 1μ in diameter at the base and stouter ones 2 to 2.5μ at the base. The former are usually

found on the delicate filiform fruits, the latter on the stout ones. However, there are exceptions, as for instance No. 2398 with stout fruits but slender sterigmata, and No. 2854 with delicate fruits but stout sterigmata which make this feature of no specific importance. The filiform sporophores retain their shape when mounted in water, the stout ones show a tendency to swell and break in pieces.

The spores of an individual plant vary from small globose to large oval ones, but, with the exception of a single European gathering whose spores were 15.6×7.8μ the average size for all the specimens examined was 10.5×6.5μ. The spores are roughened by flattened warts readily observed with a water immersion lens—a feature apparently not heretofore noticed.

On dead wood. Toronto; Muskoka; Rideau Lake; Niagara Glen.

Nos. 2607, 2605, 2606, 2396T, 2397T, 2398T, 2330, 2604, 2360, 2854, 2855, 2856, 2857, 2858, 2859, 2902, 2533, 2534F.C.

CERATIOMYXA PORIOIDES (Alb. and Schw.) Schroeter, Engl. and Prantl. Nat. Pflanz. I, i: 16. 1889.

At maturity this well known species is suggestive of a Polypore rather than a myxomycete. Its sporophores resemble a minute delicate honeycomb with hexagonal pores. The walls at the angles of the mouth of each pore are produced into characteristic knob-like lobes. It occurs on dead wood, aggregated in scattered porous globular masses varying in size from 0.2 mm. to 3 mm. in diameter, or effused net-like over the surface of the substratum covering several square centimetres. The colour has been described by Lister as white, but Macbride remarks "the colour is most inconsistent, white, rosy, yellow". To this list of colours, brown is to be added, as in No. 2341, part of a porous mass is white, part pale yellowish brown, and the colouration was not restricted to the sporophores but extended to the maturing plasmodium. DeBary evidently noticed the yellowish form only, for he states "der andere bekannte ectospore Myxomycet *Ceratium porioides* unterscheidet sich von dem beschriebenen nur durch die gelbe Farbe und durch die einem Polyporus-Hymenium ähnliche Gestalt seines Sporenträgers". The transparent oval spores are the same as those for the two preceding species.

The question of specific rank of the *porioides* type of *Ceratiomyxa* has been frequently raised. Fries in 1829—Syst. Myc. III, p. 295—remarks "duae sunt distinctissimae inter has vero longa formarum intermediarum series". Macbride in agreement takes the same view, but states "the intermediate series is a fact, however, and even specific

differences hard to maintain in this part of the world". Lister recognized but one species—*C. fruticulosa*—in the genus, and makes *C. porioides* merely *C. fruticulosa* var. *porioides* Lister, because he contends there is a graded series connecting all forms. Dr. Sturgis reports *porioides* as never having been found in Colorado and *C. fruticulosa* as everywhere common in Colorado—a state in which the slime-molds have been studied thoroughly. No intermediate series has been found in Ontario. All in all, it seems preferable to adhere to the judgment of Albertini and Schweinitz, Fries, Macbride and others in making it a distinct species.

On dead wood. Toronto; York Mills; Muskoka; Rideau Lake.

Nos. 2183, 2332, 2341, 2358, 2608.

Cienkowski reticulata Rost., Versuch, p. 9. 1873.

A beautiful collection of this small species was found at Spruce Creek, Penna., on a dead oak sapling by Professor J. H. Faull in September, 1911. Not only do the sporangia appear as a close-meshed net but almost like an aethalium, so closely are the sporangia crowded together, one patch being almost 1 cm. in diameter. Because of the rarity of the species, th s opportunity is taken of recording its occurrence in a new locality.

On dead wood. Spruce Creek, Pa.

No. 2236.

Comatricha elegans Lister, Brit. Mus. Guide to Brit. Mycet., p. 31. 1909.

In the summer of 1918, Dr. Faull made a collection of *Physarum viride* Pers. on chestnut burs at Ithaca, N.Y. Amongst these fruits were scattered four whole fruits and the remains of many stalks of *Comatricha elegans* Lister. The minute globose sporangia are 0.14 mm. in diameter, on slender black shining stalks, the total height of the fruits being .26 mm. The columella scarcely exists and branches immediately into the capillitium. The threads are not very dark brown. This specimen is intermediate between *C. elegans* Lister and *C. lurida* Lister, but is much closer to *C. elegans* Lister.

On chestnut burs, pine needles. Ithaca, N.Y.

Nos. 2908, 2512T.

Comatricha irregularis Rex, Proc. Acad. Nat. Sci. Phil. 1891.

In the gathering which we have of this species there are tufts of blackish-brown sporangia about 4 mm. high with slender black shining stalks almost equal in length to the sporangia. They rise from a silvery-brown hypothallus that is rather inconspicuous. In all respects they

agree with Lister's description, except that the spores are not "brownish-purple, often paler on one side, closely spinulose 8-10μ in diameter", but correspond to Macbride's description "spores by transmitted light brown, minutely warted, 7-8μ in diameter". According to Macbride this species is not common, but Sturgis found it abundant in Colorado. This is its first record from Canada.

On dead wood. Lambton Mills.

No. 2196.

COMATRICHA NIGRA Schroeter, Cohn. Krypt. Fl. Schles., III, Pt. 1: 118. 1885.

Lister states that the sporangia of this species may be "globose, ellipsoid or cylindrical". All our specimens have small delicate globose sporangia about 1 mm. in diameter on long slender stalks, thus agreeing with the description of the only *C. nigra* Macbride recognized, as he notes that "this species is easily recognized by its almost globose sporangia mounted on long slender stalks".

On dead wood. Waverley, Mass.; High Park, Toronto.

Nos. 2065, 2373, 2374, 2420T, 2900.

COMATRICHA NIGRA Schroeter, var. AEQUALIS (Pk.) Sturgis, Colorado Coll. Publ., Sci. Ser., XII: 33. 1907.

One specimen of this variety was found by Mr. Craigie in High Park, Toronto, in 1914. The total height of the fruits is 5 mm., the sporangium 3 mm. and stalk 2 mm. There is a typical dense crisped network with few free ends but with many free colourless branchlets and spores 7μ in diameter. The fruits are too big and dark for *C. typhoides*, but they undoubtedly approach that species.

On dead wood. High Park, Toronto.

No. 2853.

COMATRICHA PULCHELLA Rost., Mon., App., p. 25, 1876, var. GRACILIS Lister, Mycetozoa (2nd ed.), p. 156. 1911.

This is a small inconspicuous species closely related to *C. typhoides* Rost. Like the small specimens of the latter it has brown oval-cylindrical sporangia 1.5 to 2 mm. high on stalks .4 mm. high, but it is distinguished from it by its looped surface net. In addition the threads do not abruptly change in thickness as in *C. typhoides* Rost., but gradually decrease in size from the coarse primary branches that spring from the columella to the fine surface net. In this latter respect it resembles *C. laxa* Rost.

On dead wood. Cambridge, Mass.

Nos. 2538 F.C., 2375.

Comatricha typhoides Rost., Versuch, p. 7. 1873.

This is the commonest species of the genus. Our specimens are from 2.5 to 5 mm. in height, the length of the stalk varying from $\frac{1}{4}$ to the total length of the sporangium. The intermediate network is looped and often the surface net also shows a loop-like character. From it are always many tiny more or less developed spinose processes or branchlets. The spores—as is the case with most myxomycetes—are the chief distinguishing feature. They vary in size from 5 to 8μ in diameter and have always a few irregularly scattered warts. These warts are sometimes flattened, sometimes spinulose, sometimes evenly scattered over the hemisphere or in groups of 3 or 4.

On dead wood. High Park, Toronto; Lambton Mills; York Mills; Rideau Lake; Beaverton; Niagara Glen; St. Andrews, N.B.

Nos. 2066, 2068, 2069, 2187, 2208, 2609, 2610, 2611, 2612, 2689, 2690, 2692, 2693, 2852, 2851, 2070, 2418T, 2691.

Craterium leucocephalum Ditm., Sturm. Deutsch. Fl. Pilze 1813-17.

This species is easily recognized by its goblet-shaped brownish sporangia which are covered by distinct yellow warts in the upper halves, that give them a yellow almost whitish appearance. The lime-knots are large, sometimes white, sometimes yellow and are aggregated in the centre to form a pseudo-columella. The spores are remarkably constant, light russet vinaceous (R), 7.8μ in diameter. Lister describes two varieties. We found neither of these.

Lambton Mills; Toronto.

Nos. 2246, 2305, 2334. 2421T.

Craterium minutum Fries, Syst. Myc. iii: 151. 1829.

This highly differentiated form is said to be very variable in colour. Our specimens are an antimony yellow (R) to Sanford's Brown (R). The crystalline bodies found in *C. leucocephalum* Ditm. are found in our specimens. This has not been mentioned by either Lister or Macbride. The spores never exceed 8μ diameter.

On leaves and twigs. Rideau Lake; Beaverton.

Nos. 2850, 2694, 2422T, 2423T.

Cribraria argillacea Pers., Roemer N. Mag. Bot., I: 91. 1794.

The large olivaceous patches of closely aggregated sporangia of this not uncommon species show a close resemblance to *Lindbladia*. The more or less globose fruits and characteristic *Cribraria* net-work of the peridium distinguish it. This network is formed by deposits of plas-

modic granules in a definite net-like pattern on the sporangium-wall. At maturity the intervening membrane forming the interstices of the meshes breaks away leaving the persistent net-like structure. This is more or less developed in our various gatherings. Some fruits have no trace of thickenings except at the extreme apex. When this is the case the plasmodic granules are more or less evenly distributed over the walls but in the same gathering are fruits with stout firm nets or some with a development only towards the base of the sporangium, leaving the apices weak or entirely evanescent. Stalked and sessile fruits are found in a single gathering. The shining khaki-coloured iridescent walls soon are dulled by the deposit of the pale spores, 3.5μ in diameter.

On dead wood. Niagara Glen.

Nos. 2847, 2848, 2849, 2425T, 2426T.

CRIBRARIA AURANTIACA Schrad., Nov. Gen. Pl., p. 5. 1797.

This species is characterized by its flattened irregularly-shaped expanded nodes. Our only specimen is slightly immature but appears to be typical according to Lister's interpretation.

On dead wood. High Park, Toronto.

Nos. 2615, 2427T.

CRIBRARIA INTRICATA Schrad., Nov. Gen. Pl., p. 7. 1797.

This is our commonest species of the genus. Before the spores are shed the fruits are buffy brown (R) and after dissemination iridescent bronze. The cup is usually well developed but we have gatherings showing all gradations from fruits with a well-defined cup to those where it is almost obsolete. The meshes are triangular but vary in size. The nodes are dark, prominent, convex, round, triangular, polygonal or oblong. They often are connected by parallel thin rays—a character emphasized by Macbride for this species—and have many free rays. There are variations amongst our specimens which indicate a close relationship with *C. aurantiaca* Schrad. Macbride states that it is a "very rare species if indeed it does occur in this country", but Lister believes it synonymous in part with *C. dictydiodes* Cke. and Balf. which Macbride has found abundant. Lister's interpretation of the species applies to our specimens.

On dead wood. Toronto; Niagara Glen; Rideau Lake; Temagami; Ithaca, N.Y.

Nos. 2083, 2084, 2191, 2206, 2235, 2613, 2614, 2616, 2843, 2844, 2845, 2901, 2428T.

Cribraria intricata Schrad. var. dictydioides Lister, Mycetozoa, 2nd ed., p. 181, 1911.

A typical though small gathering of this variety was made by M. E. Currie at Rideau Lake in August, 1919.

On dead wood. Rideau Lake.

Nos. 2890, 2429T.

Cribraria languescens Rex, Proc. Acad. Nat. Sci. Phil., 1891.

The tiny red-brown scattered fruits of our one specimen are 2 mm. high and have weak stalks three or more times the diameter of the sporangia. The cup is deep, well developed, yellowish in colour and studded with purple plasmodic granules. The net has prominent polygonal nodes connected by 3 to 5 slender threads which form triangular meshes. Some of the fruits have a very small rudimentary net with large irregular nodes corresponding exactly to Macbride's description of *C. cuprea* Morg. Lister includes *C. cuprea* Morg. with *C. languescens* Rex. Macbride lays stress on the paler more yellow colour of *C. cuprea* Morg., but since colour is perhaps the most variable feature of a myxomycete we feel justified in following Lister in including this in the species *C. languescens* Rex.

On dead wood. Rideau Lake.

No. 2842.

Cribraria macrocarpa Schrad., Nov. Gen. Pl., p. 8. 1797.

This is the largest species of the genus. Some of our fruits are 2.5 mm. in height, the sporangia about $\frac{1}{3}$ of the total height. Collection No. 2841 shows a rather unusual feature in that there is a small basal cup which is continued into ribs before branching into the typical network.

On dead wood. Snelgrove; Toronto; Temagami; Niagara Glen; Ithaca.

Nos. 2081, 2841, 2617.

Cribraria purpurea Schrad., Nov. Gen. Pl., 8. 1797.

Typical rose-madder-colored fruits of this species were gathered on dead coniferous wood near Toronto by Mr. W. J. Clapson in October, 1919. Macbride in his "N. Am. Slime-Moulds" reports it from Maine, New York, Pennsylvania and Ontario, but says it is rare.

On dead wood. Toronto.

Nos. 2891, 2433T.

CRIBRARIA SPLENDENS Pers., Syn. Fung., p. 191. 1881.

Two gatherings of this very rare species were made near Toronto. They are those forms which Lister refers to as approaching *C. tenella* Schrad. About twenty strong ribs take the place of a hemispherical cup.

On dead wood. Toronto.

Nos. 2200, 2618, 2436T.

CRIBRARIA TENELLA Schrad., Nov. Gen. Pl., p. 6. 1791.

Our one gathering of this species is in exact agreement with Lister's description of "a very small neat variety of *C. tenella* with long stalks and sporangia 0.2 to 0.3 mm. diameter with hardly any cup" which was sent to him several times from the United States.

On dead wood. Niagara Glen.

No. 2840.

DIACHAEA BULBILLOSA Lister, Journ. Bot. XXXVI: 165. 1898.

The globose sporangia of this dainty rare species are $\frac{1}{3}$ to $\frac{1}{2}$ the height of the stalk, the total height of the fruit being 2 mm. The broad-based chalk-white stalk tapers into a clavate to cylindrical columella which projects into the sporangium and is filled with lime granules. The spores are 7.8μ in diameter with 6 to 8 scattered warts across the diameter. These warts are not distinct nor coarse enough to warrant placing the species with *D. splendens* Peck, and are too coarsely warted for *D. leucopoda* Rost. It has heretofore been reported only from Ceylon and Java.

On dead wood. Rideau Lake.

Nos. 2839, 2913.

DIACHAEA SPLENDENS Peck, Rep. N.Y. Mus. XXX: 50. 1878.

This species has been reported from Ontario by Macbride although there are no specimens in our collection.

DIACHAEA LEUCOPODA Rost., Mon., p. 190, fig. 178. 1875.

This, one of our commonest slime-molds, forms extensive colonies on living leaves, grasses, fern fronds, and fallen leaves and twigs. The white calcareous persistent stalks make it easily recognizable. The spores are pale clear brownish drab (R), nearly smooth, 9μ in diameter. With the water immersion lens very minute warts 15 to 20 across the diameter of the spore may be seen. Our specimens show remarkable constancy. The tissues of the living plants underlying the *Diachaea* fruits are killed.

On living leaves, stems and grasses, dead leaves, twigs and rubbish. Humber Valley, Toronto; Port Credit; Beaverton; Niagara Glen; Rideau Lake; Ithaca, N.Y.; Temagami.

Nos. 2437T, 2539, 2540, 2541, 2203, 2204, 2207, 2619, 2620, 2695, 2834, 2835, 2837, 2838.

Dictydiaethalium plumbeum Rost., Versuch, p. 5. 1875.

Our specimens of this bizarre species agree with the normal type described by Lister. The aethalia are flat, dark olive or ochraceous brown, varying in size from 1 to 2.5×1 to 4 cm. and under the hand lens appearing like the surface of the compound eye of an insect. Their colour is so like that of the substratum that they are easily overlooked. The threads representing the angles of the sporangia are sometimes straight, sometimes flexuous. In one of our specimens, No. 2696, these threads are joined by cross ribs. Sturgis also reports a specimen showing cross ribs but says that "the normal form also occurs in the same specimen". This was not true for No. 2696. The spores from different collections vary in the degree of roughness and in size from 7.8 to 10.5μ in diameter.

On dead wood. York Mills; Toronto; Rideau Lake.

Nos. 2072, 2073, 2074, 2438T, 2621, 2696.

Dictydium cancellatum Macbr., N.Am. Slime-Moulds, p. 172. 1899.

This is a very easily recognized species occurring in small and large colonies on decaying logs and stumps. The beautiful rectangular-meshed sporangium wall is a constant feature but in other characters the species exhibits a wide range of variation. The stalks may be stout and short, scarcely twice as long as the diameter of the sporangia, or slender, four to eight times as long as the diameter of the sporangia. The total height varies from 1 to 5 mm. The colour of the fruits may be any shade from purplish to brownish red, and the colour is not connected with any other feature. In a single gathering fruits occur with and without a tiny cup. The number of ribs is not constant and a more or less developed *Cribraria*-like network may be present or absent at the apex of the fruit.

Macbride recognizes two varieties, *D. cancellatum cancellatum* and *D. cancellatum purpureum*, and Lister two, *D. cancellatum fuscum* and *D. cancellatum alpinum*. Among our specimens variations are met with corresponding to these varieties, but one form so grades into another that they cannot be recognized as distinct varieties.

On dead wood. Toronto; Snelgrove; York Mills; Lambton Mills; Muskoka; Niagara Glen; Rideau Lake; Ottawa.

Nos. 2085, 2087, 2088, 2089, 2163, 2178, 2242, 2331, 2439T, 2440T, 2586, 2542, 2697, 2698, 2699, 2832, 2833.

DIDERMA ASTEROIDES Lister, Mycetozoa, (2nd ed.), p. 113. 1911.

An excellent collection by Dr. Faull of this exquisite species was made from a rotten coniferous log in Lorne Park, near Toronto, in October 1915. The globose sporangia are of a rusty or light-brown colour, sometimes mottled, about 1 mm. in diameter. At maturity, the cartilaginous outer wall—to which the delicate inner wall usually closely adheres—breaks down radiately with considerable regularity into about fifteen lobes which are reflexed against the substratum; the exposed inner face of these lobes is snow white, and the hemispherical columella which is now uncovered is rather large and whitish or cream coloured; a group of these suggest tiny marguerites. Many of the sporangia are sessile but some possess a very short, stout, light-coloured stalk. *D. asteroides* is said to be a very rare species and in America not to have been reported elsewhere than in Colorado. It is evidently closely allied to *D. radiatum* (L.) Morgan, differing from that species by such apparently inconstant or trivial characters that it might be included therewith. I am influenced in keeping it separate here by the almost exact resemblance of our specimens to the illustrations of *D. asteroides* (Plate 97) given by Lister, especially in respect to the lobation; but this disposition can be regarded only as tentative.

On rotten coniferous wood. Lorne Park.

Nos. 2176, 2401T.

DIDERMA EFFUSUM Morg., Myx. Miami Valley, Journ. Cincinnati Soc. Nat. Hist. 1894.

This species forms elongated, flat branching net-like or effused plasmodiocarps, the outer calcareous wall soon disappearing. All forms may occur in the one collection. The internal characteristics of our gatherings are remarkably constant, *e.g.*, the pale colourless capillitium, and smooth, pallid vinaceous-drab (R) spores, 6.5-8μ in diameter. On comparison with a European specimen it was found that the European has slightly darker, larger and rougher spores, brownish drab (R), 9μ in diameter.

On fallen leaves, twigs, bark, living leaves and living ferns. Bolton; Swansea; Rideau Lake; Niagara Glen.

Nos. 2044, 2274, 2409T, 2825, 2826, 2827, 2828, 2829, 2830, 2831.

DIDERMA FLORIFORME Pers., Roemer N. Mag. Bot., I: 89. 1794.

A beautiful specimen of the sporangia of this species, stalked and crowded together in their characteristic clumps, was collected by Miss Marjorie Cook at Meaford, Ontario. The pinkish-cinnamon peridia

are revolute in floriform lobes, exposing the hemispherical mass of brown spores, or if these have escaped, the pale clavate columellae. Spores are dark vinaceous drab (R), 10.5μ with strong scattered warts.

On dead wood. Meaford.

Nos. 2824, 2402T.

Diderma globosum Pers., Roemer N. Mag. Bot., I: 89, t. IV, figs. 4, 5. 1794.

This species is very similar to *D. spumarioides* Fries, occurring in chalk-white patches which vary from 1 to 25 sq. cm. or more, and is distinguished from it by having larger rougher spores and two separate layers of the peridium. The outer layer of the peridium, usually widely separated from the inner, is crustaceous, of the purest white, brittle porcelain-like consistency; the outer layer in *D. spumariodes* is thick white, but typically somewhat farinaceous, and adherent to the inner. Macbride divides this species into two, viz. *D. globosum* Pers. and *D. crustaceum* Peck., on the ground that there are two constant series, the former with small spores, 8-10μ in diameter, the latter with large spores 12-15μ in diameter. The former, *D. globosum*, he states is rare and not known to him outside the State of Iowa. An examination of our own material gives the following results with respect to spore measurement: No. 2003, 9-11μ; No. 2343, about 11μ; No. 2306, 12-15μ; No. 2252, 14.8μ; No. 2346, 14.85μ; and No. 2403 (a collection by Meylan in Switzerland), 10-11μ.

Rostafinski states that the spores of *D. globosum* are pale violet, 8μ in diameter; but Lister affirms he found the spores in Rostafinski's specimens to be 11-13μ in diameter. There is undoubtedly great variation in the size of the spores and in the absence of any observations relative to a constancy that might indicate different strains, it seems desirable to throw all into the same species. If this were not done our No. 2003 would have to be separated along with No. 2343 as an intermediate—an unsatisfactory proceeding. The spores are dark brownish drab (R).

On twigs, moss and leaves. Swansea; Toronto; Port Credit; Rideau Lake.

Nos. 2003, 2282, 2306, 2343, 2346, 2403T, 2823.

Diderma hemisphericum Hornem, Fl. Dan., fasc. xxxiii: 13. 1829.

This species is inconspiculous and its flat disc-shaped stalked sporangia might easily be confused with scales or adhering particles of the twigs and bark on which it is found. The stalk is pale buff, the columella flesh

coloured. Lister reports it as common in Europe but Macbride says it is "rather rare but widely distributed". It has not been reported from Canada. On comparison with a European specimen collected by Torrend, our gatherings are found to be similar in all respects.

On twigs and bark. Rideau Lake.

Nos. 2822, 2404T, 2889.

DIDERMA SPUMARIOIDES Fries, Syst. Myc., III: 104. 1829.

The sporangia of this species are closely aggregated in white farinaceous patches on the substratum and when mature the wall soon breaks away. This wall is of two layers, and may be thick or thin. The outer calcareous one is closely appressed to the thin inner membranous one. Sometimes when the wall is very thin the spores shine through, giving the sporangia a grey appearance. The spores are pale vinaceous drab (R), 9μ in diameter. Several fine collections have been made from this district.

On fallen twigs and leaves. Swansea; High Park; Toronto; Caledon; Rideau Lake.

Nos. 2004, 2199, 2304, 2307, 2328, 2329, 2410T, 2411T, 2535.

DIDERMA TESTACEUM Pers., Syn., p. 167. 1801.

The beautiful sessile pale-pink subglobose sporangia of this species are commonly met with in our woods, often side by side with *Physarum sinuosum* Weinm., and like the latter fruiting on fallen leaves and the bases of herbaceous plants and grass stems. The lime granules composing the outer calcareous crust may be large, 3μ in diameter. The capillitium is quite colourless, but occasionally is tinged with brown.

On dead wood, bark, fallen leaves, living grass and leaves of herbaceous plants. Toronto; Beaverton; Niagara Glen; Rideau Lake.

Nos. 2188, 2412T, 2536, 2700, 2821, 2897.

DIDYMIUM CRUSTACEUM Fries, Syst. Myc. III: 124. 1829

We have one copious gathering of this rare and remarkable species. The irregularly aggregated highly crustaceous sporangia cover many square centimetres of moss, bark, leaves and grass. In America it seems only to have been reported from Iowa and South Dakota. The sporangia of the type are said to be sessile or shortly stalked, but Macbride finds only the sessile condition in the American material examined by him. The phenomena presented by our collection are rather interesting—the hypothallus is in general well developed, a whitish transparent

membrane, much roughened or irregular in contour; under the sporangia it appears as if drawn upward so as to form short compressed membranous stalks. Macbride finds the capillitial threads rather coarser than might be expected, but in our material it is apparently typical—quite such as is illustrated by Lister (Plate III). The crustaceous outer layer of the peridium is one of the most striking features of this form, giving to it the appearance of a *Diderma*. Examination shows it to be composed of large crystals, and in accord with general experience we find these rather loosely bound together, so that very soon this farinaceous crust—widely separated from the thin inner peridium—falls to pieces. The spores are typical and vary from 10-13.5μ in diameter.

On the bark of a dead branch. Wilcox Lake.

No. 2198.

Didymium melanospermum (Pers.) Macbr., N. Am. Slime-Moulds, p. 88. 1899.

This is one of the commonest species of the genus. Most of our specimens have the characteristic gregarious subglobose sporangia, umbilicate beneath, with short black stalks, but occasionally one finds confluent sessile sporangia forming plasmodiocarpous-like structures. The colour of the sporangia varies, according to the amount of lime, from dark grey to white. The crystals may be more or less developed. Sometimes they are irregularly shaped as if eroded by a solvent, and sometimes they are massed together in clumps.

On pine needles, leaves, fallen spruce twigs, rubbish and dead wood. Algonquin Park; York Mills; Port Credit; Toronto; Ithaca, N.Y.; Rideau L.

Nos. 2047, 2326, 2273, 2286, 2622, 2243, 2543F.C., 2820, 2445T.

Didymium melanospermum (Pers.) Macbr., var. minus Lister, Mycetozoa (2nd ed.), p. 129. 1911.

The variety differs from the type in having tiny sporangia, .3 – .5 mm. in diameter, and smaller spores, 8μ in diameter. The warts sculpturing the spores are not proportionately smaller than those of the type but if anything larger. The capillitium is more delicate but dark calyciform thickenings are present.

On leaves. Toronto.

Nos. 2240, 2444T.

DIDYMIUM NIGRIPES Fries, Syst. Myc., III: 119. 1829.

The small, white, globose sporangia of this species on their slender translucent brown stalks are found evenly scattered over dead wood or leaves. Macbride found only small fructifications of the species but an excellent gathering in the herbarium of the University of Toronto has multitudes of dainty sporangia on a piece of moss 6 cm. square. The colour of the stalk, columella and capillitium is inconstant. On these differences in colour Lister bases two varieties, *D. nigripes* var. *eximium* and *D. nigripes* var. *xanthopus*, while Macbride makes of these distinct species. The other characters are so similar that we follow Lister in recognizing only varieties.

On moss, and dead wood. Toronto; Niagara Glen; Rideau Lake.

Nos. 2020, 2048, 2446T, 2818, 2819.

DIDYMIUM NIGRIPES Fries, var. EXIMIUM (Peck.) Lister, Mycetozoa (2nd ed.), p. 130. 1911.

A beautiful collection of this variety on pine needles made by Professor Atkinson at Thomasville, Ga., is apparently the form described by Macbride as the species *P. eximium* Pk. The sporangia are globose, umbilicate beneath, grey with a yellowish tinge on slender translucent orange-brown stalks, which are a little darker towards the base. The sporangium-wall is clear transparent, membranous, pinard yellow (R). The yellow colour is not due to coloured granules as in the specimen described by W. C. Sturgis in the "Type Specimens of Myxomycetes" (Trans. Conn. Acad. 1900, p. 479), but to colour in the wall itself. There is a thin layer of white lime-crystals. The columella is almost spherical and concolorous with the orange-brown stalk. From it arises a dense fuliginous capillitium of slender threads covered with minute warts. The spores are pale brownish drab (R) nearly smooth, 7.1μ in diameter.

On pine needles. Thomasville, Ga.

It has been reported from Muskoka, Ontario by Lister (Mycet., 2nd ed., p. 131).

Nos. 2443T, 2910.

DIDYMIUM SQUAMULOSUM Fries, Symb. Gast., p. 19. 1818.

This extremely abundant and variable species vies with *D. melanospermum* Pers. as being the commonest of the genus. Even a single gathering may exhibit both plasmodiocarps and stalked sporangia side by side, with a capillitium showing all gradations from dark threads to delicate colourless ones. The majority of our specimens have distinctive white-stalked globose or subglobose sporangia, a capillitium of coarse

dark threads with calyciform thickenings and large dark spores. The spores may be from 7.8 to 12μ in diameter. In some specimens the lime is in perfect stellate crystals, in others in irregularly-shaped granules which appear to have been eroded by some solvent. In a manure and sphagnum culture by Miss J. McFarlane in the laboratory in February, 1917, a yellowish-white plasmodium was noticed streaming over the sides of the dish. In the course of a few days this heaped up and formed typical white-stalked globose sporangia of *Didymium squamulosum* Fr. The capillitium consists of dark slender threads and the spores are a deep lilac colour, 9-10μ in diameter. This appearance of the species was of especial interest since Macbride notes that it is found "about stable-manure heaps, in flower beds and on richly manured lands". Another plasmodium was obtained from spores sown on artificial culture medium in April 1919. It was a watery-white colour and fruited readily, forming sessile white globose fruits.

On mossy dead wood, moss, dead leaves and a living Oxalis leaf. Massee found it on the under side of a living leaf of Colt's Foot, *Tussilago farfara*. Swansea; Toronto; Rideau Lake; Niagara Glen; Long Id., N.Y.

Nos. 2041, 2042, 2043, 2045, 2046, 2272, 2449T, 2450T, 2544, 2815, 2816, 2817, 2895, 2896.

Enteridium Rozeanum Wing., Proc. Acad. Nat. Sci. Phil. 1889.

This species is one of our commonest. Our specimens vary in size from a small shining globular aethalium not quite 1 cm. in diameter to large oblong ones 5×3 cm. In colour they may be red bronze, wood brown (R) or sorghum brown (R). In this locality they are frequently parasitized by insects.

On dead wood and bark. Toronto; Algonquin Park; York Mills; Bedford, Mass.

Nos. 2075, 2076, 2077, 2078, 2292, 2545.

Fuligo septica Gmelin, Syst. Nat., p. 1466. 1791.

This species probably exhibits greater variation than any other species of the endosporic myxomycetes. The sporangia are aethaloid masses occurring either singly or in groups of two or three. The aethalia vary much in size, shape and colour. Our specimens are from 1 to 8 cm. in diameter and are usually flattened oval or round masses; one unusual specimen is in the herbarium of the University of Toronto which matured on a living leaf of skunk cabbage and formed a fruiting mass, 26 centimetres long and 19 centimetres wide. The fruits show a great variety of colours; pale lemon yellow (R), empire yellow (R)

grey white, fawn (R), sorghum brown (R), dull green yellow (R), ochraceous buff (R), mustard yellow (R), onion skin pink (R), and white. Some have a thick soft calcareous crust or cortex which varies in thickness and smoothness, others have instead a brittle brown membranous wall resembling in external appearance that of *Enteridium*, others have scarcely any development of cortex and have a very irregular surface due to the convoluted sporangia. Peck (in the Rep. of N.Y. State Mus. of Nat. Hist., XXXI, 1879) states that for *Fuligo varians* (= *Fuligo septica* Gmelin), "variant forms present diverse appearances, those with a floccose aethalium would appear rather to constitute another species, while the form with a naked gyrose surface seems still more worthy of specific distinction. Aside from its external peculiarities its external structure strengthens the idea of its specific validity. Nevertheless it must be admitted that the spores are so nearly alike in all forms that they do not confirm the differences exhibited externally. I am of the opinion that the last mentioned form will yet be separated from the others". Lister affirms "it is found that if the rising plasmodium is protected by a bell-glass from currents of dry air, the sporangia develop well throughout; there is no cortical layer and a number of small aethalia may be formed rather than a single one: when on the other hand the young aethalium is exposed to dry winds or sunlight the cortex becomes thick". A careful examination has been made of the different forms in our herbarium. In both the flocculent rough ones and those with a gyrose surface the cortex is composed of compressed barren sporangia but in the former there is an abundant deposit of round lime granules which make the sporeless sporangia stouter and less easily compressed, sometimes the deposits are so abundant that the sporangia retain their convoluted form; in the latter the limeless membranous walls cannot resist pressure and are easily flattened out. It is rather striking that of all the specimens with a membranous cortex all but one were collected in the late autumn. Strange to say the forms with a cortex rich in lime usually possess a dense capillitium of hyaline threads with but tiny white or yellow sparkling lime-knots, whereas the limeless forms have a dense capillitium of hyaline threads joining large irregularly shaped lime-knots, either white or cream coloured. Occasionally, there are forms which have no barren cortex, whose sporangium-walls encrusted with lime form the wall of the aethalium.

The species is so variable and there are so many intermediate forms that the specific relation of the naked gyrose form referred to by Peck and in my opinion identical with our specimens with the thin brittle brown membranous wall must be determined by a series of experiments.

On dead wood, tree trunks, birch bark, moss, leaves, twigs and the bare ground. Guelph; Snelgrove; York Mills; Toronto; Foster's Flats, Niagara; Muskoka; Lambton Mills; Go-Home Bay; Rideau Lake; Hot Springs, Va.; Niagara Glen.

Nos. 2006, 2010, 2011, 2013, 2014, 2211, 2231, 2248, 2250, 2277, 2308, 2313, 2320, 2342, 2345, 2349, 2351, 2354, 2365, 2454T, 2546F.C., 2623, 2624, 2811, 2812, 2813, 2814.

A most interesting abnormal development of *Fugilo septica* Gmel. is exhibited by a specimen collected in Niagara Glen during the summer of 1918. It is a white pulvinate aethalium, surrounding the end of a chip, having a cortex of a thick layer of white lime granules. The capillitium is extraordinary in that in closely resembles that of *Mucilago*. There are the same brown to colourless irregular threads whose angles are often delicate colourless expansions. Sometimes perforated broader ones are found suggesting *Enteridium*. They originate in the shining membranous walls of the convoluted sporangia as pale thin colourless strands, which anastomose and expand after becoming darker in colour and then ending in these colourless threads. The spores are pale lilac grey (R), 7.8 to 8μ in diameter and almost smooth. This specimen was submitted to Dr. Sturgis for inspection, who, notwithstanding the peculiar character of the capillitium—"merely left-over material in any case and the least dependable feature of compound forms"—believes the apparent absence of a columella, the lime occurring in minute discrete round granules without a trace of crystalline formation and the small pale smooth spores afford quite conclusive evidence as to the correct diagnosis being *F. septica* Gmel.

Fuligo cinerea Morg., Myx. Miami Valley, 105. 1896. Journ. Cincinnati Soc. Nat. Hist. 1893-96.

This species is not so common as *Fuligo septica* Gmel. Macroscopically, the grey-white pulvinate aethalia resemble *Mucilago*. The large white lime-knots and large ellipsoid spores distinguish it from the other members of the genus. Morgan "Myx. of the Miami Valley" found small aethalia. Both our gatherings have large conspicuous fruits.

On dead wood and rubbish. Port Credit; Toronto.

Nos. 2283, 2377.

Hemitrichia abietina Lister, Mycetozoa (2nd ed.), p. 227. 1911.

This rare species of *Hemitrichia* is very easily recognized by its unusual capillitium. The threads are loosely and irregularly wound by two spirals. Two typical specimens are in the herbarium at Ottawa.

Our collection—a slide—comes to us through the courtesy of the Dominion Botanist from a typical gathering made near Ottawa and stored in the herbarium of the Dominion Experimental Farm.

Nos. 2457T, 2909.

HEMITRICHIA CLAVATA Rost., Versuch., p. 14. 1873.

This is one of our commonest species. The yellow gregarious clavate stalked fruits are found on damp mossy logs from early spring to late in the autumn. Where we recognize but the one species Macbride recognizes three—*H. stipitata* Mass., *H. montana* Morg. and *H. clavata* Rost. The differences are based on the character of the capillitium. *H. stipitata* has a dense capillitium with no free ends, the threads 5 to 6μ in diameter; *H. montana* Morg. has a spinulose or warted capillitium of threads 7μ in diameter with free inflated tips; the sporangia are whitish and nearly sessile; *H. clavata* has a capillitium with many free ends, 5 to 6μ in diameter. All our collections are of the *H. stipitata* type yet free capillitial ends are occasionally found and also some with inflated tips so that all three of Macbride's divisions are suggested in the one colony.

The sporangium-wall is generally papillose but in a few of our specimens it shows beautiful fan tracery. The spores are about 7.8μ in all of our gatherings except one No. 2628, which has very small spores 5.5μ. This is smaller than has been reported. The sessile type is said by Dr. Rex to be peculiar to cold weather. It is of interest to note that all our specimens which exhibit this peculiarity have been collected in the late autumn.

We have found it quite impossible to establish lines of demarcation following Macbride, and adhere to the broader interpretation of *H. clavata* followed by Lister.

On dead wood. Toronto; Port Credit; York Mills; Rifle Ranges, Toronto; Rideau Lake; Niagara Glen; Ottawa; Beaverton; Ithaca, N.Y.; Spruce Creek, Penna; Bedford, Mass.

Nos. 2115, 2118, 2117, 2119, 2120, 2169, 2171, 2254, 2278, 2288, 2299, 2323, 2368, 2455T, 2456T, 2625, 2626, 2627, 2628, 2701, 2702, 2807, 2806, 2803, 2810.

HEMITRICHIA KARSTENI (Rost.) Lister, Mycetozoa, p. 184. 1894.

This is one of our rare collections. Hitherto it has not been reported east of Montana. Our gathering has both sessile globose fruits and plasmodiocarps. They vary in colour from yellow to dark reddish brown or black. The darker coloured ones on examination proved to be slightly

immature. The capillitium is an irregularly-branched contorted network of spirally sculptured threads which here and there have large bulbous expansions 9μ or more in diameter. There are a few free ends, some clavate, some pointed.

On dead wood. High Park, Toronto.

No. 2249.

Hemitrichia Serpula Rost., Versuch., p. 14. 1873.

The sporangia of this beautiful wide-spread species are bright yellow plasmodiocarps coiled about each other to form a net. There is little variation in the sparingly branched spiny yellow capillitium of our specimens. The spores are 10 to 13μ in diameter. In one gathering No. 2127, they are sculptured into irregular meshes by rows of tiny warts which are arranged in serpentine bands. Those of all the other specimens are evenly reticulated by narrow bands into about 12 meshes per hemisphere.

On dead wood and fallen twigs. High Park, Toronto; Muskoka; Niagara Glen; Rideau Lake.

Nos. 2127, 2804, 2805, 2316, 2892, 2584.

Hemitrichia Vesparium (Batsch.) Macbr., N. Am. Slime-Moulds, p. 203. 1899.

This common species is at once recognized by its bright reddish capillitium. It vies with *H. clavata* Rost. in frequency. The fruits vary from greyish red to reddish black, the commonest colour being intermediate between the two. The capillitium of our gatherings shows slight variation in the number and length of spines on the threads and in the tightness with which the spirals are wound. One gathering has threads with knob-like thickenings, and in addition to the spirals a few large rings.

On birch bark and dead wood. York Mills; Toronto; Port Credit; Rideau Lake; Niagara Glen; Bedford, Mass.; Long Id., N.Y.

Nos. 2123, 2124, 2125, 2126, 2168, 2175, 2218, 2293, 2547, 2548, 2629, 2630, 2631, 2632, 2633, 2634, 2549T, 2635, 2801, 2802.

Lamproderma arcyrionema Rost., Mon., p. 208. 1875.

Myriads of the shining bronze iridescent sporangia of this species were found covering the under side of a fallen log at Niagara Glen in the summer of 1918. By transmitted light the peridium is brownish drab (R). The spores are 7.8μ in diameter, with the water immersion

lens warted—a dark wart here and there. The capillitium is typical, the threads crisped and roughened. Another gathering made later in the summer is also typical. Macbride bases his classification of *Lamproderma* on the colour of the peridium. *L. arcyrionema* comes under the group "peridium not blue, silvery". Our specimens are bronze. Lister's classification—according to spore characters—seems to be a better one to follow. Macbride notes that the branching of the columella may be elsewhere than at the apex but this is not a constant feature. Our gatherings show branching only at the apex of the columella. The species is reported as abundant in the United States.

On dead wood. Niagara Glen.

Nos. 2460T, 2550F.C., 2799, 2800.

LAMPRODERMA VIOLACEUM Rost., Versuch, p. 7. 1873.

This is one of the most beautiful of the myxomycetes. On October 28th, 1915, a large colony of the purplish-violet, green or bronze iridescent sporangia of this species was found covering two square feet or more of a yellow birch log, *Betula lutea*. They arose from a glistening yellow hypothallus and were distributed uniformly over the wood. On drying, the evanescent peridia disappeared, leaving the characteristic radially disposed straight capillitial threads like little stalked beacon lights. There are two collections, both collected in the late autumn, in our herbarium, differing from each other more or less, but both showing the features characteristic for *L. violaceum* Rost. They are about the same size 1.5 mm. in height. The capillitium is made up of threads pale at their origin, then becoming darker and finally pale and colourless at their extremities. One No. 2376 collected in the Don Valley in 1915 has not a very dense capillitium and is peculiar in that the pale colourless extremities show a tendency to form a *Stemonitis*-like surface net. The threads are fawn colour (R) at their bases, shading to brownish drab (R), and colourless at their tips. There are a few of the fruits of this same collection with a much denser and more flexuous capillitium. The other collection No. 2636 found at the Rifle Ranges, Toronto, has a much denser, more anastomosing capillitium of chocolate threads, paler at their origin and extremities. The spores are minutely spinulose, light brownish drab, 8μ in diameter. Macbride states the spores to be 9-11μ in diameter, but our specimens more closely agree with those of Lister who reports them as 8-10μ in diameter.

On dead wood. Don Valley; Rifle Ranges.

Nos. 2376, 2636.

Leocarpus fragilis Rost., Mon., p. 132, fig. 93. 1875.

This glossy species, one of our commonest, and one of the most cosmopolitan, has oval sporangia occurring in different shades of brown from auburn (R), ochraceous tawny (R), to Sandford's brown (R), which, as Massee says, resemble the eggs of some insect. In our specimens they are shortly and weakly stalked; in one collection the peridium has ruptured in floriform revolute lobes. In 1917 myriads of the typical sporangia were found densely covering living blades of grass; another very fine gathering from Port Credit is a colony of scores of sporangia on decayed wood covering an area of 18×3.5 cms., and another plasmodium has fruited on green mosquito netting.

On twigs, bark, dead wood, living grass. Toronto; Snelgrove; Spruce Creek, Pa.; Ithaca, N.Y.; Port Credit.

Nos. 2039, 2040, 2296, 2300, 2275, 2637, 2638, 2552, 2464T.

Lindbladia effusa Rost., Mon., p. 223. 1875.

Several typical ochre-brown spongy fruits of this species varying from a hemispherical aethalium 2 cms. in diameter to an oblong effused aethalium 7 cms. x 2 cms. were gathered by Professor J. H. Faull on coniferous logs at Temagami during the summer of 1919. Heretofore the species proper has not been reported from Ontario, although it is said to be abundant in the forests of New Brunswick.

On dead wood. Temagami.

Nos. 5001, 5135, 2468T, 2553 F.C.

Lindbladia effusa Rost. var. simplex Rex, Bot. Gaz., XVII: 202. 1892.

This variety though widely distributed and fairly abundant in the United States of America has not been reported previously from Canada. Two collections were made at Rideau Lake in 1917. In one, No. 2639, the cylindrical sporangia with their convex summits are very closely aggregated together but are not confluent. In many can be seen an attempt to form a coarse *Cribraria*-like network, as was noted by Dr. Rex. There are many plasmodic granules on the pale-yellow membranous walls arranged in clusters and in regular symmetrical rows suggestive of the ribs of *Cribraria*. A few fruits have a short irregularly-shaped stalk. The other specimen when first observed on July 30th, formed extensive masses of a dark bluish-black jelly-like plasmodium on a mossy log, some patches 10 sq. inches in area. Jahn describes it as "black like cart-wheel grease". It was evidently beginning to form fruits as the surface was

uneven due to regular areolations. By August 2nd, there were large olive-brown aethalia composed of more or less adherent sporangia with iridescent bronze walls. Soon the convex summits broke away like *Perichaena* lids, the tubular hollow sporangia full of clay-coloured spores. There are many free sporangia around the edges of the fruits. The clusters of plasmodic granules are not arranged on the walls in regular rows as in the other specimen, but are scattered unevenly about.

On moss and dead wood. Rideau Lake.

Nos. 2639, 2640.

LYCOGALA CONICUM Pers., Syn., I: 159. 1801.

This rare species closely resembles the thin-walled fruits of *L.epidendrum* Fr. Both may have wart-like vesicles scattered over the sporangium wall but those of *L. conicum* Pers. are always larger, more prominent and are purple, whereas those of *L. epidendrum* are concolorous with the sporangium-wall. Lister states that the purple vesicles are confluent. Those of our specimens are isolated warts.

On dead wood. Ithaca, N.Y.

No. 2641.

LYCOGALA EPIDENDRUM Fries, Syst. Myc., III: 80. 1829.

Unlike *L. flavo-fuscum* Rost., the aethalia of this exceedingly common species are usually found in groups of from three to many. They are often so closely crowded together as to be pressed into many different shapes. The colour varies from a pale yellowish-brown to blackish-brown, and the size even in a single gathering may vary from 0.3 cm. to 1.8 cm. in diameter. The sporangium-wall is thin. There are vesicles concolorous with the pale membranous wall and varying in size scattered irregularly over the surface. The capillitium is a mass of intertwining wrinkled tubules; the majority are about 8μ in diameter.

On bark and dead wood. Toronto; York Mills; Don Valley; Muskoka; Temagami; Niagara Glen; Chelsea; Ithaca, N.Y.; Sumner, Mo.; Waverley, Mass.

Nos. 2154, 2155, 2156, 2157, 2174, 2263, 2315, 2355, 2556, 2554, 2555, 2470T, 2159, 2795, 2796, 2797, 2798.

LYCOGALA FLAVO-FUSCUM Rost., Versuch, p. 3. 1873.

The genus *Lycogala* first attracted the attention of collectors on account of the similarity of the aethalia in external appearance to puff-balls and has been known and recognized for years, especially this species which is the largest in the genus. The hard brown spherical

fruits vary in size—our largest aethalium in the herbarium is 3.8 cms. in diameter and was found growing on the bark of a living elm tree. There are rarely more than one or two fruits in a single gathering. It does not occur as frequently as *L. epidendrum*, and is easily distinguished from it by its thick hard brittle three-layered cortex.

On living trees, dead wood, roots of *Acer saccharum* and bark. Toronto; Port Credit; Rifle Ranges.

Nos. 2227, 2238, 2353, 2588.

Mucilago spongiosa Morgan, Bot. Gaz., XXIV: 56. 1897.

In external appearance this species shows a remarkable resemblance to *Fuligo septica* Gmel., the thick deciduous crust of stellate lime crystals being analogous to the cortex of *Fuligo*. Occasionally these crystals agglomerate and lose their sharp outlines making the analogy even more pronounced. It is extremely variable in size, habit and microscopical features. The smallest aethalium in our collection is one about 1.5 cm. in diameter and the largest is a large effused greyish-white pulvinate fruit covering many square centimetres which at first sight might be confused with *Fuligo cinerea* Morg. In the summer of 1918 a spindle-shaped specimen was found encircling the stem of a maple leaf. It was 3.5 cm. long and 1.7 cm. in diameter at its widest part. The capillitium shows no constancy. In one gathering, No. 2038, it is very scanty and consists of delicate brown to hyaline slightly branching and anastomosing threads, 1.5μ in thickness, with a few calyciform thickenings In another, No. 2339, it is an intricate net-work of branching and frequently anastomosing coarse threads mostly dark brown but hyaline in places and with some calyciform thickenings. These threads are of unusual size, 2.5 to 3μ in thickness. The capillitium of the other gatherings shows an intergradation in the degree of anastomosing and the size of the threads between these two types. Macbride evidently examined specimens of the former type only for he claims that the capillitium of *Mucilago* is "scanty, of simple mostly dark coloured, slightly anastomosing threads". Lister's description embraces both; "capillitium a network of widely branching anastomosing stout purplish-brown or colourless threads often with dark calyciform thickenings, hyaline at the extremities where it is attached to the sporangium wall or columella". The peridium, too, is subject to slight variation. A gathering in the herbarium of the University of Toronto made by Torrend in Portugal, No. 2513, has a peridium marked with ridges which form a regular hexagonal pattern. This occurs in many species of myxomycetes. Our specimens of *Mucilago* have the ridges present but they rarely show indications of a regular pattern.

It is a well-known fact that this species forms its fruits above the ground on living stems of small bushes, herbaceous plants and grasses. Wulff in 1906 noticed the snow-white aethalia of this species on green grass plots in gardens which looked as if cream had been spilled. Again in 1908 he describes its prolific occurrence in a meadow. One of our gatherings is an effused pulvinate aethalium which was found at Guelph in 1910, growing over living strawberry vines; the capillitium is an abundant anastomosing network of colourless and faintly coloured threads with calyciform thickenings; the spores are slightly smaller than the type. The strawberry leaves over which the plasmodia had crept were killed, as plant tissues usually are which underlie myxomycete fruits.

On leaves, petioles, twigs and bark. High Park, Toronto; Caledon; Guelph; Ithaca.

Nos. 2037, 2038, 2268, 2339, 2513T, 2794.

OLIGONEMA FLAVIDUM Peck, Rep. N. York Mus., XXXI: 42. 1879.

We have three gatherings of *Oligonema* in our collection—two from Toronto and one from the United States—the last collected by Beardslee and identified by Torrend. Externally all three are alike. Internally they show differences only with respect to the capillitium. The sporangia are sessile, globose to obovoid, shining golden yellow, 0.2 to 0.6 mm. in diameter, and aggregated on the substratum to form effused patches. The sporangial-wall in each case is clear yellow with microscopic punctate or granular markings on its inner surface. The spores of all three are indistinguishable; they are globose, reticulated irregularly by very thin bands which occasionally are pitted and measure 12 to 13μ in diameter. The capillitium is dissimilar for all three and must be described for each individual collection. In collection No. 2472, it is very scanty, consisting of short stout rough cylindrical elaters, rounded at each end and only slightly longer than the diameter of a spore—identified by Professor Torrend as *O. nitens* Rost., but apparently Peck's *O. brevifilum* Pk. In No. 2230, there is a more abundant capillitium, but it is still scanty. The elaters are rough and short but with a few long threads intermixed. In collection No. 2253, the capillitium is abundant and consists of long pale unbranched smooth threads with occasional very short threads intermixed. The identification of these three collections apparently turns on the markings on the elaters. Not one of them can be *O. nitens* Rost. if Lister's interpretation of *O. nitens* Rost. be correct ("sporangia globose, heaped together; sporangium-wall smooth; spores irregularly reticulated"), because the sporangia are not heaped, and the sporangium-wall is roughened with granular thickenings. Nor can any

one of them be *O. flavidum* Pk. ("sporangium ovoid, crowded; sporangium-wall with minute granular thickenings; spores regularly reticulated"), for the spores are irregularly reticulated. Sturgis, who has studied Peck's types carefully, considers that Lister's interpretation of the species of *Oligonema* is incorrect. He finds—if he himself has recognized *O. nitens* correctly—that the sporangium-wall of *O. nitens* is in many instances not to be distinguished from that of *O. flavidum* and hence that markings on the sporangium-wall cannot be taken as a diagnostic specific feature. His drawings of the spores of *O. flavidum* and *O. brevifilum* also show that the reticulations are distinctly irregular—not regular as maintained by Lister. He finds further that the one feature said to differentiate between *O. flavidum* Pk. and *O. brevifilum* Pk.—namely, length and abundance of the elaters—is an inconstant one. He finds many variations with respect to the elaters and their abundance and concludes, and apparently rightly so, that *O. brevifilum* is not a good species but only a condition of some collections of *O. flavidum*. Sturgis, however, does recognize the two species *O. nitens* and *O. flavidum*, affirming that the distinction between the two is based on the markings of the elaters. He defines *O. nitens* as a species, the elaters of which are smooth or with spiral markings and sometimes a few ring-like thickenings, and *O. flavidum*, the elaters of which are densely and minutely spinulose or punctate. In spite of this he describes forms that seem to me to link the two. Therefore, because of the essential emphasis thus placed on the capillitial markings I have very carefully examined the elaters of all three of our collections with a Zeiss water immersion lens. The three have essentially the same markings though they are more pronounced in No. 2472 and No. 2230 than in No. 2253. In fact they are so faint in No. 2253 that the elaters at first seem smooth. There are a few scattered warts and thin spiral bands which here and there anastomose to form a reticulation. The edges of the spirals give the threads a warted appearance. From my observations I am quite ready to accept Sturgis' opinion that *O. brevifilum* is synonymous with *O. flavidum*, but I am still in doubt as to whether there is a real distinction between *O. flavidum* and *O. nitens*. Nowhere is there an account of the markings on the elaters as described here. It would seem quite probable that Lister in the first edition of his manual was right in recognizing but one species of *Oligonema*—*O. nitens*—though final judgment cannot be passed on this matter until the capillitium of an extensive series of specimens has been minutely examined. It would be surprising if it be found that distinct specific differences can be based on the capillitium of this genus which is admitted by everyone to be extremely variable. Provisionally because of not having seen authentic material of *O. nitens*

Rost. and because of the evident correspondence of our material to Peck's *O. flavidum*, all three are tentatively labelled *O. flavidum* Peck.

On dead wood. Toronto.

Nos. 2230, 2253, 2472T.

PERICHAENA CHRYSOSPERMA (Currey) Lister, Mycetozoa, p. 196. 1894.

This is a rare species represented in Canada by a single typical collection at Ottawa. The threads of the capillitium are studded by long curved spines. The spores are 8 to 10μ in diameter agreeing with *P. chrysosperma* as described by Lister.

No. 2473T.

PERICHAENA CORTICALIS (Batsch.) Rost., Mon., p. 293. 1875.

Macbride reports this species as rare but we find it the most abundant of the genus in Ontario. In all our gatherings the tiny, inconspicuous, scattered, sessile sporangia are a cameo brown (R). The capillitium is sometimes scanty, sometimes abundant, concolorous with the antimony-yellow (R), smooth, minutely warted spores.

On dead wood. Toronto; Rideau Lake; Ottawa; Meaford.

Nos. 2160, 2474T, 2476T, 2475 F.C., 2791, 2792, 2793.

PHYSARUM AURISCALPIUM Cooke, Ann. Lyc. Nat. Hist. New York, XI: 384. 1877.

A typical gathering of this species made near Toronto in October, 1914, has a few sessile sporangia intermingled with the typical golden-yellow stalked fruits. The spores are found to vary from nearly smooth to minutely spinulose and from vinaceous buff (R) to brownish drab (R). Stalked forms of this species are said by Lister to merge insensibly into *P. Maydis* Tor.

On bark. Port Credit.

Nos. 2258, 2480T, 2481T.

PHYSARUM CINEREUM Pers., Roemer N. Mag. Bot., I: 89. 1794.

This inconspicuous yet easily recognized species is one of a number of myxomycetes usually found fruiting on living grass and stems of herbaceous plants. While doing so they kill the underlying plant tissues. We have two excellent specimens of this species which illustrate this habit. One, Professor Faull discovered as a plasmodium creeping over living grass and clover leaves which it soon sheathed with clumps of its tiny globose grey fruits, 0.3 mm. in diameter. Another was sent to the

laboratory by Mr. W. A. McCubbin from St. Catharines. A large quantity of grass is covered by a soft white down due to the lace-like remnants of the transparent peridia and snowy capillitium. Our other specimens are on wood. Peck mentions this species as occurring on "living leaves and petioles of wood sorrel, *Oxalis acetosella*, Williamstown, Oswego County", and Harshberger believed it a parasite on grass.

Our specimens show a variation in the size and colour of the spores. The majority are light vinaceous drab (R), 10-11μ in diameter, but those of Mr. McCubbin's specimen are darker, slightly rougher, 11-15μ in diameter.

Macbride distinguishes between *P. cinereum* Pers. and *P. plumbeum* Fr., the former with spores 11-12μ in diameter, the latter 7-8μ. Lister on the other hand includes *P. plumbeum* Fr. in his interpretation of *P. cinereum* Pers. with spores 7-10μ in diameter, but makes a separate species of *P. vernum* Lister based on larger, rougher and darker spores, 9-12μ in diameter. We have followed Lister in including *P. plumbeum* Fr. and Macbride in including *P. vernum* Lister in the one species *P. cinereum*. If differences in spore size serve to separate species, Mr. McCubbin's specimen is undoubtedly typical *P. vernum* Somm., while our other forms are typical *P. cinereum* Pers.

Port Credit; York Mills; Ithaca, N.Y.; St. Catharines; Caledon; Rideau Lake.

Nos. 2219, 2379, 2790, 2789, 2898, 2484T, 2485T, 2559F.C.

Physarum compactum (Wing.) Lister, Mycetozoa, p. 44, 1894.

This species according to Professor Macbride is common in Canada. During July, 1918, two collections were made from Niagara Glen, both typical. The fruits are erect with shining bronze sporangium-walls which have ruptured in a floriform manner, said by Mr. Wingate to be "a marked character for many specimens". The stalks are pure white throughout, only a few show the slight discolouration towards the base. Our two specimens differ in the distribution of capillitial lime. In one the central mass of lime is represented by a coarse *Badhamia* network, the delicate threads showing no lime inclusions; in the other the central mass of lime is a solid ball lying free at the apex of the stalk and there are a few tiny lime inclusions in the delicate network of threads. A comparison with a collection made and identified by Mr. Wingate corroborated our diagnosis of the species.

On wood. Niagara Glen.

Nos. 2787, 2786, 2578F.C.

PHYSARUM COMPRESSUM Alb. and Schw., Consp. Fungi, p. 97. 1805.

This species is the commonest of the *Physarums* often occurring in great abundance and year after year on the same substratum. It is extremely variable in shape and appearance, and many forms may be found produced by the same plasmodium—No. 2019 has subglobose, globose, compressed and reniform stalked fruits as well as plasmodiocarps. Like many of the *Physarums* our specimens have spores slightly paler on one side, dark vinaceous drab (R). In determining the limits of this species I agree with Professor Macbride in extending Lister's description so as to include *P. connatum* (Pk.) Lister. Macbride calls the species *P. nephroideum*.

Lister recognizes *Physarum connatum* Peck (Lister) as a distinct species differing from *P. compressum* Alb. and Schw. in having more symmetrical sporangia and more angular lime-knots. This form we find to be merely a variation of the type. In many collections globose, turbinate stalked fruits, supposedly typical of *P. connatum* occurred side by side with compressed plasmodiocarpous ones. No fruits were found that did not have a capillitium with both rounded and angular lime-knots and from Macbride's description of *P. nefroideum* Rost. we believe this is characteristic of our American forms.

On dead wood, leaves, bark, rubbish, earth. Algonquin Park; Swansea; Toronto; Port Credit.

Nos. 2161, 2182, 2223, 2266, 2267, 2378, 2017, 2018, 2019, 2034, 2036, 2015, 2023, 2024, 2025, 2215, 2284, 2643, 2642, 2487T, 2644, 2785.

PHYSARUM CONTEXTUM Pers., Syn., p. 168. 1801.

The elongated oblong yellowish-white sporangia of this species are easily recognized, not only by their habit of occurring in densely crowded patches on leaves and twigs, but also by their yellowish-white cartilaginous outer walls which soon break away from the thin inner ones. Our specimens are paler—cream colour (R)—than those of a European specimen in our herbarium which is pale yellow orange (R). They are typical in all respects.

On twigs, leaves and moss. Algonquin Park; Toronto.

Nos. 2033, 2327, 2488T.

PHYSARUM DIDERMA Rost., Mon., p. 110. 1875.

Our two gatherings of this rare species have sessile crowded globose fruits, .8 to 1.5 mm. in diameter. The *Diderma*-like calcareous outer crust is white with an occasional yellowish discoloured sporangium. There is an inner delicate membranous transparent colourless wall. The capillitium is dense with many irregularly-shaped lime-knots con-

nected by delicate hyaline threads. The spores are dark dusky brown (R), 10.5 to 13μ in diameter, distinctly warted and paler on one side. Having no type to examine, Lister believed *P. Diderma* was his *P. didermoides* var. *lividum*, which he interprets as having but a single wall. We follow Macbride in recognizing Rostafinski's *P. Diderma* as a distinct species; it is certainly not *P. didermoides* var. *lividum*.

On dead wood. Rondeau Park, Maple.

Nos. 2788, 2906.

Physarum flavicomum Berk., Hook. Lond. Jour. Bot. IV: 66. 1845.

This species is closely allied to *P. polycephalum* Schw., though perfectly distinct and without intergradations. It exhibits a similar habit of creeping over and consuming *Polypores*, preferring them to any other kind of food. Twice has the greenish-yellow plasmodium been found on fungi in the woods, once by Professor Faull when it had covered and eroded a fruit of *Lentinus lepidus*, and later by Mr. W. A. McCallum on a fruit of a polypore—*Polyporus lacteus*. Both these plasmodia were kept in culture for some time. They fruited readily and it was possible to examine many fruits which had fruited on various artificial media. The sporangia are monocephalic, *viride*-like, though occasionally they may be lobed. They vary in size from 0.2 mm. to 0.7 mm. in diameter, all sizes originating from the same plasmodium. They vary in colour from dull grey to iridescent bronze, the colour depending upon the amount and colour of the lime included in the pale-yellow peridium. The translucent brown subulate stalks are never clustered and each arises from a small radiant hypothallus little larger than the extended basal portion of the stalk. The fruits often appear sessile but when these are closely examined a stalk is always found reclining on the substratum. The capillitium consists of triangular, rod-like or fusiform lime-knots varying from pale greenish yellow (R) to pinard yellow (R). Some fruits which have matured on artificial media have very pale, almost white, lime-knots and a few were found with no lime. When limeless the capillitium is a dense pale membranous network radiating from the base of the sporangium. It is interesting to note that the weak-stalked apparently sessile sporangia have very little if any lime in the capillitium. The spores are vinaceous drab (R), nearly smooth, 7.8 to 10.5μ in diameter. One interesting gathering from Niagara Glen has peculiar band-like orange lime-knots resembling those of *P. viride* var. *rigidum* Lister. This species has been reported from Ottawa, but apparently is not uncommon around Toronto.

On fleshy fungi and dead wood. York Mills; Port Credit; Niagara Glen; Newfield, N.J.

Nos. 2558F.C., 2645, 2782, 2783, 2784.

PHYSARUM GLOBULIFERUM Pers., Syn., p. 175. 1801.

This is an inconspicuous and dainty species very similar in habit both to *P. viride* var. *incanum* Lister and *P. nutans* Pers. from which it differs in the globose form of the sporangia, by having a white or straw-coloured calcareous stalk, a small columella, slightly smaller spores and a persistent capillitium which retains its shape even after the wall has completely broken away. The sporangia may be any shade from white to green gray, according to the amount of lime included in the peridium. The lime-knots of the capillitium are always numerous but they may be tiny and clear or large opaque, 13.6μ in diameter, almost buff coloured in transmitted light. One specimen, No. 2780, collected at Rideau Lake has them aggregated in a dense mass which after spore dispersal appears to be an almost solid spherical mass of lime. The stalks are sometimes firm and stout, sometimes so weak as to recline on the substratum, and in one specimen, No. 2650, they show a tendency to coalesce. Collection No. 5144 has sporangia in groups of from four to eight.

On dead wood. High Park, Toronto; East Toronto; Rideau Lake; Niagara Glen; Ithaca, N.Y.; Temagami.

Nos. 2179, 2646, 2647, 2648, 2649, 2650, 2703, 2779, 2780, 2771, 2781, 5144, 2651.

PHYSARUM LATERITIUM Morgan, Myx. Miami Valley, Journ. Cincinnati Soc. Nat. Hist. 1896.

This species can be recognized almost without any microscopical examination by its conspicuous orange or brick-coloured sporangia, mottled with clusters of Brazil Red (R) lime granules. A single gathering of it was obtained in July. Some of the lime-knots exhibit the bright red centres described by Lister and Sturgis, others are all pale yellow with slightly deeper yellow centres. The latter condition suggests the reason for Macbride affirming "This pied condition does not come out in any of our specimens". Some of the expansions of the capillitium have none or very few lime deposits, others have the lime in small granules, while in others the granules are large crystalline nodules.

On dead leaves and fallen twigs. Lambton Mills.

No. 2244.

PHYSARUM LEUCOPHAEUM Fries, Symb. Gast., p. 24. 1817-18.

We have five collections of this species, originally founded by Fries and retained by Macbride, but which Lister makes *P. nutans* var. *leucophaeum* Lister. The sporangia never nod as do those of *P. nutans* Pers. In one of our gatherings both stalked and sessile sporangia occur

and sometimes there is a suggestion of a columella. The capillitium is a dense hyaline network, sometimes with little or no lime, sometimes with large irregular knots confluent in the centre of the sporangium, but never are there the tiny sparkling white lime-knots throughout, found in *P. nutans* Pers.

We are under obligations to Professor Macbride for a specimen of typical material from Oregon.

Sturgis expresses doubts as to whether or not the species is distinct from typical *P. nutans*, but his objections are invalid as the material before him (a collection of E. and E., N.A.F. No. 2693 with nodding sporangia) was apparently typical *P. nutans* wrongly labelled as *P. leucophaeum;* in other words he had not seen *P. leucophaeum*. Lister's and Macbride's interpretations are practically identical, except that Liste claims that there are gradations into typical *P. nutans*. Such gradations have not been reported from America, and the characters of our plants are so distinctive that it appears best to follow Macbride and retain Fries' species.

On dead wood. Toronto; Meaford; Oregon.

Nos. 2774, 2775, 2776, 2778, 2907.

P. leucopus Link, Mag. Ges. Nat. Fr. Berl., III: 27. 1809.

P. leucopus Link is probably more likely to be confused with *P. leucophaeum* Fries than with any other species, and the question arises as to whether or not these species may not be identical. The main distinguishing character according to Lister is in the constitution of the stalk; in *P. leucopus* the stalk is white and limy throughout, in *P. leucophaeum* lime if present is restricted to the outer layer which may vary in colour from white to black, and there is dark refuse matter in the centre. But no two authors agree on the critical diagnostic features of these two species (cf. Lister, Macbride and Massee). *P. leucopus* is considered rare; it is recognized as containing much lime and in this respect no important variation is permitted; to *P. leucophaeum* on the other hand every latitude is granted with respect to the amount of lime contained—a feature largely bound up with the amount of available lime in the substratum; a trifle more variation in lime content granted and at one end of the series we have *P. leucopus*. Now there are certain facts that suggest that such a conclusion is correct, though the question still remains unsettled. Thus—(1) It is fairly certain that our specimen No. 2777 is a part of the collections No. 2776 and No. 2778 which are plainly *P. leucophaeum*, (2) Lister has labelled a collection "*P. leucophaeum* with a white stalk", and Massee (3) claims hybridization of *P. leucopus* × *P. leuco-*

phaeum by bringing the plasmodia of the two together, a conclusion that cannot be correct if Jahn's account of sexual fusions in the slime-molds be accepted. At best, Massee's so-called hybrids were the result of a mixing of plasmodia, one with more lime than the other. If these species be identical, then the name *P. leucophaeum* disappears.

On dead wood. Meaford.

No. 2777.

PHYSARUM NUTANS Pers., Usteri Ann. Bot., XV: 6. 1795.

This species is at once recognized by its tiny lenticular nodding sporangia on their slender non-calcareous stalks. Sturgis says it "grades almost imperceptibly" into *P. compressum* Alb. and Schw. and *P. leucophaeum* Fr. and "closely resembles" *P. viride* Pers. The striking resemblance to the last named species is seen in all our gatherings but we found no gradations into the two former. Its slender habit and more or less umbilicate fruits distinguish it, and in addition the capillitium is never as coarse nor are the spores as dark as in *P. compressum* Alb. and Schw., and the spores are never as large nor as rough as in *P. leucophaeum* Fr.

On mossy bark and dead wood. Toronto; York Mills; Rideau Lake; Ithaca, N.Y.

Nos. 2021, 2022, 2030, 2309, 2653, 2704, 2498T, 2499T.

PHYSARUM POLYCEPHALUM Schwein., Syn. Fung. Carol., p. 63. 1822.

The curiously lobed fruits that usually occur in clusters of from three to ten make this species unmistakable, even at first sight. The sporangia are sometimes yellow, sometimes grey, the yellow colour being dependent upon the colour and amount of lime included in the pale membranous peridium. The stalks are subulate, membranous, translucent, usually adhering to each other though they may be free. Lister relegates those that occur singly to var. *obrusseum* but we found that fruits standing singly are intermixed with those that are fasciculate. The capillitium is a dense hyaline network with yellow lime-knots which show much variation. Some are pale yellow, but every gradation in colour may be found, primuline yellow (R) being the most common. In shape they vary from tiny round *globuliferum*-like ones, which are scattered through the capillitium, to slender rods attached to the sporangium wall. The spores are dark purple drab (R), 8 to 10μ in diameter. A plasmodium was obtained in 1917 from spores of a magnificent collection made by Professor Faull at Alexandria, Pa. Characteristic fasciculate clusters of the typical grey and yellow lobed fruits covered a large area of twigs,

bark and leaves. Macbride noted for this species a colourless plasmodium which changed to yellow preceding fructification. The one which we obtained was a chrome yellow (R) when it first originated. It became slightly paler in colour on exposure to sunlight and almost orange before fructification or sclerotia formation, and although it has been kept in culture up to date—May, 1919—it has never been white. It lives and fruits on artificial media but consumes and flourishes upon many fleshy fungi. It cultures especially well on *Polyporus resinosus*.

On dead wood. Alexandria, Pa.; Ithaca, N.Y.
Nos. 2502T, 2561F.C., 2654, 2655.

Physarum pulcrhipes Peck, Bull. Buff. Soc. N. Hist., I: 64. 1873.

This species has been reported from Mass., Ohio, Pennsylvania, New York and Michigan, but has not been reported previously from Canada. Four large gatherings were collected, two at Rideau Lake in 1917, one in 1919, and one at Niagara Glen in 1918. The latter when discovered was a brilliant orange plasmodium creeping about on the under side of a rotten log. Within three hours it heaped up to form typical fruits. This is the first record of the plasmodium. The bright vermilion stalks make the species unmistakable. The tiny globose fruits may be shining bronze, iridescent or purplish grey with a yellow bloom, or quite orange. The orange colour depends upon the abundance of lime included in the peridium, which is usually denser towards the base of the sporangium. Lister states that this species has a conical columella but Macbride points out that the columella is "scant or none". We are in agreement with Macbride. The fruits of one gathering have a small convex columella, but this is absent in others. The dense capillitium with its orange lime-knots shows no variation and the spores are brownish drab (R), 7.8 to 8μ in diameter.

On dead wood. Niagara Glen; Rideau Lake; Thomasville, Ga.
Nos. 2705, 2706, 2769, 2770, 2899.

Physarum sinuosum (Bull) Weinm., Fr. Syst. Myc. III: 145. 1829.

The fructifications of this remarkable species occur in extensive patches in low-lying woods. The plasmodium creeps over fruits or fallen leaves and twigs, moss, effused fungi, dead wood and even on living plants. In a gathering made at Beaverton in 1917, it has fruited on the living stems of *Impatiens biflora*, *Onoclea sensibilis* and a mint. The sporangia resemble bivalves on edge; when ripe the valves separate to

enable the spores to escape. The white grey or buff fruits may occur singly or in more or less contorted or branched plasmodiocarpous series. Macbride says "where the substratum affords room the plasmodiocarpous style prevails; in narrower limits the sporangia stand singly". In our collections are specimens of both forms which occur side by side regardless of space. The spores are brownish drab (R), minutely warted, 8-10μ in diameter. The species is abundantly represented in Ontario and is one of the most easily recognized. One gathering, No. 2709, has sporangia which form a plasmodiocarpous network on wood with spores dark vinaceous drab (R), slightly paler on one side, 12μ in diameter. Though the spores are larger and darker than the type, it seems best to include this specimen in *P. sinuosum* Weinm.

On bark, dead wood, twigs, effused fungi, living leaves and herbaceous stems. Toronto; York Mills; Beaverton; Niagara Glen; Rideau Lake; Syracuse, N.Y.

Nos. 2032, 2193, 2225, 2241, 2247, 2707, 2708, 2502, 2565, 2563, 2709, 2767, 2768, 2504T, 2505T, 2564F.C.

PHYSARUM TENERUM Rex, Proc. Acad. Nat. Sci. Phil. 1890.

This species has been reported from the Adirondack Mountains and Ohio in the United States, but this is the first record of its occurrence in Canada.

The slender inconspicuous yellowish-grey fruits have slender pale-yellow subulate calcareous stalks sometimes slightly darker towards the base as in No. 2765. These stalks together with the capillitium which is made up of exceedingly delicate hyaline threads connecting pale greenish-yellow round lime-knots combine to make the species unlike any other. The total height of the fruits of our specimens is 1.5 to 2 mm. but the sporangia of collection No. 2765 are 0.4 mm. in diameter, while those of No. 2766 are only 0.2 mm. The spores are pale vinaceous drab (R), 8-9μ in diameter, minutely spinulose with scattered groups of papillae. To distinguish this species from *P. citrinum*, Lister lays emphasis on the absence of a columella. In a few fruits of No. 2765 there is a very small conical columella, but the other features—the habit, capillitium and lime-knots are perfectly characteristic and diagnostic for *P. tenerum* Rex.

On wood. Niagara Glen; Rideau Lake.

Nos. 2765, 2766, 2507T.

Physarum testaceum Sturgis, Colorado Coll. publ., Sci. Ser., xii: 18. 1907.

This species was described first by Sturgis in 1907 from specimens collected in Colorado. A comparison with other collections made from various districts throughout the United States showed that the species is not infrequent but heretofore had been observed imperfectly. The greatest confusion seems to have arisen because of many resemblances to *P. Diderma* Rost, *P. didermoides* Rost., and especially *P. didermoides* var. *lividum* Lister. It differs from these forms in a number of particulars, while resembling them in possessing a *Diderma*-like calcareous crust. The sporangia of *P. testaceum* are always sessile and compactly crowded, while those of *P. didermoides* Rost. are stalked. It is true that the sporangia of *P. didermoides* var. *lividum* are sessile, but they have only one sporangium-wall and much larger spores. Sturgis placed especial emphasis on the spore characters. The spores described by him are 8 to 10μ in diameter, while those of *P. didermoides* Rost. are 10-13μ and *P. Diderma* Rost. 10-12μ. Our gatherings all agree with the type in respect to the characters of their spores which are dusky brown (R), minutely warted, paler on one side, 8-10μ in diameter, but we find certain slight variations in the colour and size of the sporangia. The outer calcareous crust is not always white as in No. 2005. We have one specimen in which it is a Russian blue (R), and another collected in Cleland Tp. near Sudbury in 1918 has the upper half a pale opalescent shining yellow, the lower half a dark brown. The sporangia of all the specimens are typical, 0.7 mm. in diameter, except in one gathering where a few are found 1.5 mm. in diameter.

On bark and dead wood. Swansea; Rifle Ranges, Toronto; Cleland Tp., Sudbury Dist.

Nos. 2005, 2762, 2763, 2764.

Physarum variable Rex, var. sessile Lister, Mycetozoa, (2nd ed.). 1911.

There is a specimen (slide) of this uncommon species in the herbarium at Ottawa which is supposed to have been collected in Canada. The sporangium-wall is yellow with brighter coloured patches of lime clusters. I have examined this slide but have seen no other specimens. Lister records it from Banff.

Physarum virescens Ditm., Sturm. Deutsch. Fl., Pilze, Abth., III. 1813-17.

This species is not rare for the New England States. The sessile crowded irregularly-shaped sporangia are found on fallen leaves and sheathing twigs. One specimen from St. Andrews, N.B., when found

was a yellow plasmodium creeping over fallen beech leaves. After being brought to the laboratory, within a few hours it formed crowded globose green-ochraceous (R) sessile fruits. The spores indicate that it is in a slightly immature condition.

On dead leaves and twigs. Ithaca, N.Y.; St. Andrews, N.B. Nos. 2370, 2761.

PHYSARUM VIRIDE Pers., Usteri Ann. Bot., XV: 6. 1795.

This very beautiful species with its delicate nodding sporangia and frail subulate stalks is one of our commonest and most easily recognized *Physarums*. The sporangia are always some shade of yellow. Lister has recognized two varieties, var. *aurantium* and var. *incanum*, based on colour characters, but he leads one to doubt the validity of these varieties by a subsequent statement that "the colour of the sporangia found on the same stump may differ from year to year". So far we find var. *aurantium* with its wholly orange fruits and concolorous lime-knots constant, showing no intergrading with paler forms, but var. *incanum* cannot be separated from the type. The var. *incanum* according to Lister is characterized by grey or pale yellowish-grey sporangia with pale yellow fusiform lime-knots. Our collection No. 2656 exhibits grey sporangia intermixed with canary-yellow sporangia, both with orange fusiform lime-knots. In another gathering, No. 2758, the fruits vary in colour from canary-yellow to nearly white and their lime-knots are concolorous with their peridia. It is interesting to note that the paler the lime-knots the more globose they become until the palest forms with their pale lime-knots are strikingly similar to *P. nutans* Pers. This recalls the fact pointed out by Professor Macbride that Fries at one time listed *P. viride* and its varieties as colour forms of *P. nutans* Pers. Rostafinski recognized a close relationship but found the coloured forms sufficiently constant to warrant their separation from *P. nutans* Pers. as a distinct species.

An interesting gathering was made at Niagara Glen during July, 1918, of a very small variety of the species. The fruits are 0.6 mm. high with subglobose nodding citron-yellow (R) sporangia 0.2 mm. in diameter. The pale-yellow membranous peridium is encrusted with prominent clusters of lime granules.

On dead wood. Snelgrove; Toronto; Rideau Lake; Niagara Glen; St. Andrews, N.B.; Algonquin Park.

Nos. 2026, 2027, 2031, 2185, 2195, 2202, 2209, 2222, 2509T, 2579T, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2710, 2757, 2758, 2759, 2760, 2771, 2772, 2773, 2029, 2298, 2756.

Physarum viride Pers. var. aurantium Lister, Mycetozoa, p. 47. 1894.

This beautiful variety is at once recognized by its deep-orange nodding sporangia on slender subulate stalks. The latter are yellowish at the top with pale-yellow ridges running down over the black bases. This variety as we have found it is constant and shows no gradations into the type, although Macbride does not recognize it as distinct.

Until we have further evidence we follow Lister's classification.

On twigs. Toronto.

Nos. 2226, 2264.

Reticularia Lycoperdon Bull., Champ. de la France. 1791.

This species is common and ordinarily is recognized by its rounded cushion-shaped silvery aethalia, but occasionally a fruit is found with a dark brittle brown membranous wall like that of *Enteridium Rozeanum* Wing. A large specimen of this latter type was found growing on the under side of a rotten hemlock log. It has a small root-like base that could almost be called a stalk. Another specimen sent to the herbarium by Mr. Bartlett of Algonquin Park also shows a stalk-like formation. The cortex though brittle and easily broken is of a membranous consistency. The spores in a mass are a rich deep purplish brown, much darker than those of *Enteridium*.

On bark and fallen logs. Toronto; Algonquin Park.

Nos. 2079, 2270, 2338, 2256, 2510T, 2511T.

Stemonitis ferruginea Ehrenb., Sylv. Myc. Berol., p. 25. 1818.

The cinnamon-brown sporangia of this widespread abundant species are found in closely packed tufts rising from a silvery hypothallus. The fruits vary in size from delicate ones 6 mm. in height to large luxuriant ones 20 mm. high, and may be any shade of sorghum brown (R). The species is recognized by its spores which are smaller than for any other species of the genus. They are pale ferruginous rarely less than 5μ in diameter and rarely exceeding 6μ. The capillitium is the most variable feature. There is a dense intermediate network of threads between the columella and the surface net. The columella always stops short of the apex. The surface net may consist of delicate threads with large or small flexuous meshes or of coarse threads with large or small distended meshes.

On dead wood. Toronto; Wilcox Lake; Snelgrove; Niagara Glen; Rideau Lake; Meaford; St. Andrews, N.B.; Thomasville, Ga.

Nos. 2054, 2056, 2057, 2061, 2162, 2190, 2297, 2364, 2366, 2371, 2372, 2514T, 2663, 2735, 2736, 2738, 2739, 2740, 2741.

STEMONITIS FERRUGINEA var. SMITHII Lister, Mycetozoa, (2nd ed.), p. 150. 1911.

According to Lister this variety is very similar to *Comatricha typhoides* var. *microspora* Lister, and is distinguished from it by the more perfect surface net. The sporangia of our specimens vary in height from 2.5 to 6 mm. There is a dense intermediate network between the columella and the surface net. The latter is delicate with typical angular meshes. It is the net which varies most of all and it often closely approaches *C. typhoides* Rost., but the spores are characteristic, rarely exceeding 3.9μ in diameter. This variety was first described and named by Macbride as a distinct species, *S. Smithii* Macbr. The type specimen was 2.5 mm. high with spores 4 to 5μ in diameter. Later he expanded his interpretation so as to include fruits 25 mm. high, with spores 5 to 7μ in diameter, thus combining it with *S. ferruginea* Ehrenb. to form a single species. As it occurs in Canada the small forms corresponding to those of his original interpretation of *S. Smithii* Macbr. are so constant in their characters that we follow Lister in classifying them as *S. ferruginea* Ehrenb. var. *Smithii* Lister.

On dead wood. Toronto; Foster's Flats; Niagara Glen; Rideau Lake.

Nos. 2055, 2333, 2664, 2712, 2216.

STEMONITIS FLAVOGENITA Jahn., Abh. Bot. Ver. Brandenb., XLV: 165. 1904.

Although this species is abundant in the British Isles and in Europe this is the first time it has been reported from America. As Lister says it is closely related to *S. splendens* Rost. and *S. ferruginea* Ehrenb., but it forms a well-marked centre of its own. Our specimen was collected by Dr. Faull during the summer of 1917 at Ithaca, N.Y. The sporangia are in clusters not quite so ferruginous in colour as *S. ferruginea* Ehrenb. The columella ceases below the apex of the fruit and the intermediate network between it and the surface net has typical broad membranous expansions. The surface net itself is delicate, very like that of *S. ferruginea* Ehrenb., but its meshes are more irregularly shaped. The spores are a distinguishing feature. They are the colour of those of *ferruginea* but are large, 7-7.8μ in diameter. On comparison with a specimen from Europe collected by Torrend we find our fruits are even more in agreement with the type described by Lister.

On dead wood. Ithaca, N.Y.

Nos. 2743, 2515T.

Stemonitis fusca Roth., Roemer and Ust. Mag. Bot., I: Pt. 2; 26. 1787.

Regrettable confusion in the use of this name has found its way into the literature for reasons that are set forth by Sturgis in his "Myxomycetes of Colorado". The type has disappeared so that we cannot settle the confusion by the only satisfactory way. The use of the name turns on the spore markings. Lister applies it to plants with reticulate spores; he says "the spores are never smooth". Macbride applies it to plants with smooth spores. The idea that the spores of *S. fusca* are smooth appears to be due to a statement by Rostafinski; but an examination of a long series of the plants so labelled and described by Rostafinski reveals the fact according to Lister that the spores are reticulate. Macbride, however, states that others of Rostafinski's specimens so labelled have slightly warted spores not reticulated. Rostafinski may be excused for not differentiating spore markings on the grounds of the inadequate optical equipment of his time—he may not have been able to separate the two types of spores. We have followed Lister's interpretation and so include here plants whose spores are reticulated. In Macbride's manual such forms pass under the name of *S. maxima* Schwein. and also *S. nigrescens* in Lister's judgment. Sturgis affirms that Macbride's interpretation of *S. fusca* is the same as Lister's *S. splendens* but Sturgis is surely in error for the *S. fusca* of Macbride's manual differs from *S. splendens* Rost. in respect to both surface net and intermediate branches.

This species is commonly found in dusky-brown feathery clusters on fallen logs and leaves. We have a very large number of collections, and the more specimens examined the more constant appear the features which characterize the species. The colour although it may be darker or paler is always the same shade—deep brownish drab (R). The spores although they vary slightly in size are reticulated by tiny spines whose bases unite to form the meshes. Most variation is met with in the capillitium. The surface net may be composed of fine threads or of coarse ones and the meshes may be large or small. Of our many specimens the meshes of the surface net are beset by tiny spinose processes except in a collection made by Torrend in Europe that has smooth meshes.

On bark and dead wood. Swansea; Muskoka; Toronto; Snelgrove; York Mills; Wilcox Lake; Niagara Glen; Rideau Lake; Thomasville, Ga.; Temagami; Rifle Ranges, Toronto; Syracuse, N.Y.; St. Andrews, N.B.; Ottawa.

Nos. 2049, 2051, 2053, 2056, 2058, 2059, 2060, 2062, 2189, 2336, 2363, 2516T, 2517T, 2575, 2665, 2666, 2667, 2668, 2713, 2744, 2745, 2746, 2747, 2748.

STEMONITIS FUSCA Roth. var. CONFLUENS Lister, Mycetozoa, (2nd ed.), p. 144. 1911.

The soft dark aethalium-like mass of twisted fruits with a few distinct isolated sporangia here and there can be distinguished from other confluent forms by the spores which are slightly larger, 8μ in diameter, and darker than typical *S. fusca* Roth., but are characteristically reticulated by broad-based spines. There are no stalks. The confluent fruits arise from the hypothallus where the lower persistent part of the peridia make cup-like receptacles for their bases. There are imperfectly-developed columellae which arch, branch and anastomose. From them arises a regular-meshed network with no surface net. The meshes are beset with spinose processes similar to those found on the surface net of the type. Lister gives a very short description for this variety; "sporangia confluent without superficial net or columellae", but it is sufficient to convince us of the specificity of our specimen. This appears to be the first American record of this variety.

On dead wood. Beaverton.

No. 2714.

STEMONITIS FUSCA Roth. var. TRECHISPORA Torrend, Fl. Myx., p. 141.

A remarkable gathering of this species was made by Professor J. H. Faull on sphagnum moss on the floor of a cold swamp, north end of Maclean's Peninsula, Lake Temagami, Temagami Forest Reserve, August 6, 1919. The confluent sporangia form large cushion-like, flattened aethalia, subcircular and irregular in shape measuring up to 7 cms. in diameter. The apices of the sporangia are rounded and give a pebbly appearance to the surface of the aethalia. Otherwise the fruits are so anastomosed with one other that they cannot be recognized individually as sporangia. The columellae arise from a silvery membranous hypothallus. They are contorted, broken and lose themselves immediately in the capillitium, which is a purple brown anastomosing network of irregularly-thickened threads. The meshes of the net are large, of many sizes and are beset with short spine-like branchlets but there is no surface net. The spores are 11.5μ to 14μ in diameter, reticulated with raised bands into from 9 to 20 meshes of varying size but complete and with a border 1μ broad.

Tentatively we have considered this specimen a confluent form of Torrend's *S. fusca* Roth. var. *trechispora*. The variety as defined by Lister includes all gatherings whose spores have a banded reticulation and is based on a specimen from Venezuela on a palm leaf marked by

Berkeley *S. trechispora*. In commenting on this Venezuelan gathering Lister informs us, in his Mycetozoa, 2nd ed., that "it consists of a number of small clusters of ill-developed sporangia with irregular columellae and imperfect surface net; the spores are 10 to 12μ diam., marked with a strong complete reticulation in the form of raised bands giving an even border 1μ wide".

On sphagnum moss. Temagami.

No. 5135.

Stemonitis herbatica Peck, Rep. N. York. Mus., XXVI: 75. 1874.

After examining type specimens of *S. herbatica* Peck, Lister recognized it as a distinct species. Macbride also examined type specimens but could not distinguish between *S. herbatica* Pk. and *S. ferruginea* Ehrenb., so united them in the one species *S. axifera* (Bull.) Macbr. Sturgis made an exhaustive study of the type specimens in the State Museum of New York, and found it impossible to distinguish between the essential features of *S. herbatica* Pk. and *S. ferruginea* Ehrenb. He writes as follows: "Like *S. Morgani* Pk. this species is an illustration of the extreme difficulties attending the effort to draw sharp lines of distinction between the so-called species of this perplexing genus. We may with almost equal propriety select certain 'centres' and group around them extensive series of intergrading forms, or select the terminal extremes of such series and regard them as more or less fixed species. The difficulty of adopting either method exclusively lies in the fact that two observers examining the same specimen may yet disagree as to its apparently essential features. Thus, in the case before us"—*S. herbatica* Pk.—"both Mr. Lister and Professor Macbride have examined the type of *S. herbatica* Pk., yet the former describes the spores as 'purplish' (not ferruginous), as in *S. splendens* Rost., while the latter described the spore-mass as 'ferruginous', as in *S. ferruginea* Ehrenb. The reason for so fundamental a difference of opinion is seen when we examine the actual specimens. I have before me an authentic specimen of *S. ferruginea* Ehrenb. received from Mr. Lister; the type specimen of *S. herbatica* Pk.; and a large number of specimens of the latter, most of them collected in this country and examined by Mr. Lister, one of them collected in England by Mr. Lister himself. The type specimen of *S. herbatica* Peck. has the sporangia densely aggregated, forming a tuft on grass; they measure 6-7 mm. in height. I can distinguish no difference, in the colour of the spore mass or of the individual spores, between this and the specimen of *S. ferruginea* Ehrenb. The habit of the two is also identical. The English gathering of *S. herbatica* Pk. has distinctly

darker spores of a purplish tinge whether examined in a mass or shed upon white paper. All of the other specimens are in form of loose tufts, 10 mm. high, growing on dead wood. The spores in the mass have light greyish-violet colour of the type, neither as purplish as those of *S. splendens* Rost., nor as ferruginous as those of *S. Smithii*, Macbr. For my own part and judging merely by the specimens in my possession, I cannot with any certainty distinguish between *S. herbatica* Pk., and *S. ferruginea* Ehrenb." In spite of this long judgment on the type of *S. herbatica*, Sturgis is not satisfied that there is no such species as described by Peck, for in a later publication he returns to the subject and in practical agreement with the Listers advises its retention.

From the material at my disposal I find *S. herbatica* Pk. distinct for our Canadian forms. The surface net is always smooth and small round meshed, and the network between the surface net and the columella is always dense, characters which have served to distinguish these forms from even the most extreme specimens of *S. splendens;* likewise I have always found that the spores are more purplish and larger than in *S. ferruginea* Ehrenb.

On dead wood. Go-Home Bay; Toronto; Muskoka.

Nos. 2063, 2217, 2257, 2289, 2337, 2749, 2893.

STEMONITIS PALLIDA Wing., Macbr. N. A. Slime-Moulds, p. 123. 1899.

We have but one specimen of this dainty rare species. The dusky fruits 8 mm. high are not clustered as in the majority of the species of the genus but scattered *Comatricha*-like over the substratum. The columellae reach nearly to the apex of the fruit and gradually taper to slender threads. There is a dense intermediate network of coarse anastomosing threads between the columella and the delicate firm small-meshed surface net. The meshes of the latter rarely exceed 26μ in diameter, and are very unevenly distended. This specimen is typical as compared with a specimen in the collection of Fungi Columbiani No. 2576. The spores are 6μ, light vinaceous drab (R), slightly darker than *S. herbatica* Pk. and minutely warted. Macbride's specimens have spores 7.5μ in diameter.

On dead wood. Rifle Ranges, Toronto.

Nos. 2576F.C., 2750.

STEMONITIS SPLENDENS Rost., Mon., p. 195. 1875.

S. splendens Rost. is another of the species of *Stemonitis* concerning which there is much divergence of opinion. Various names have entered into the discussion, such as *S. morgani* Pk., *S. fenestrata* Rex., *S. fusca*

(Roth.) Rost. As I understand *S. splendens* Rost. it is characterized by a scanty intermediate network, a large smooth-meshed surface network and spores faintly warted, cinnamon drab (R), 6-8μ in diameter. I found much variation in the superficial net, for while other features remain constant the net may be small round meshed reminding one of *S. herbatica* Pk. I have followed Lister in his interpretation of the species.

On dead wood. Toronto; Temagami; Niagara Glen; Ottawa; Thomasville, Ga.

Nos. 2210, 2518T, 2337, 2751, 2752, 2753.

Stemonitis splendens Rost. var. flaccida Lister, Mycetozoa. 1894.

There are several confluent types of *Stemonitis*. Thus Lister describes a confluent variety of *S. fusca*, another of *S. herbatica*, and a third as a distinct species, *S. confluens* Cooke and Ellis, formerly regarded by him as a variety of *S. splendens* Rost. and which we believe to be synonymous with his *S. splendens* var. *flaccida* Lister. All these confluent forms are characterized by short stalks or none at all, irregularities in the columellae, imperfectly-developed surface nets and anastomoses of individual sporangia. In a general way they exhibit the characters of the species of which they are varieties, especially in relation to spore features.

The fruits of *S. splendens* var. *flaccida* Lister form dense soft masses of confluent or loosely-adherent sporangia, about 7 mm. to 10 mm. in height, which arise from a purplish iridescent hypothallus. The stalks are more or less developed, sometimes they branch and fork so near the base that they appear wholly absent, or they may be weak, shining, and quite free from each other, reaching a maximum height of 2 mm. The sporangia are sometimes closely confluent throughout, but their tips may be quite free. The peridium is fugacious. Small flakes of it remain intermixed with the capillitium. The columellae may be quite distinct and end abruptly a short distance below the free sporangia tips or they may branch, anastomose and lose themselves in the capillitium, thereby scarcely recognizable as columellae. The purple-brown network forms loose meshes, the axes usually flattened and expanded. There is no distinct surface net but springing from the meshes all through the network are tiny spinose processes similar to those found on the surface net of *S. fusca* Roth. The spores are evenly warted, the same colour and appearance as those of *S. splendens*, light brownish drab (R), 8 to 12μ in diameter.

Lister and Macbride recognize *Stemonitis confluens* Cooke and Ellis as a distinct species characterized by large spores. Lister quotes 8 to 11μ in diameter for spore size, and Macbride 12μ. The spores of our specimens have an average size of 8.2μ in diameter and are indistinguishable from those of typical *S. splendens* Rost. They agree in all respects with the descriptions of *S. confluens* Cooke and Ellis; even the spores although smaller than those examined by Macbride fall within the range given for the species by Lister.

Lister reports it from several states of the United States of America, Macbride reports it as rare. He is acquainted with only two collections made by Ellis in the course of twenty years—both on oak bark.

On dead wood. Toronto; Temagami; Port Credit.

Nos. 2234, 2754, 2755.

TRICHIA AFFINIS deBary, Rost. Mon., p. 257. 1875-76.

This species has small globose apricot-yellow (R) crowded sporangia. It is easily distinguished from *T. favoginea* Pers. by possessing narrower elaters and spores with a narrower border. It is not so readily separated from *T. persimilis*. The two species are apt to show variations approaching each other. The differentiating feature is the character of the spores. Macbride does not consider even this distinction of sufficient value or constancy to warrant the separation of the two species. A careful examination of our species leads us to recognize the two specific centres. The spores of *T. affinis* are regularly reticulated into a few large meshes by narrow pitted bands. Occasionally there is a wart or group of warts in the centre of a mesh.

On dead wood. High Park, Toronto; Ithaca, N.Y.

Nos. 2102, 2519T, 2520T, 2669.

TRICHIA BOTRYTIS Pers., Roemer N. Mag. Bot., I: 89. 1794.

The sporangia of this species are stalked and are said to occur singly as well as in clusters; when in clusters the stalks are confluent and ribbon-like. We have two gatherings from Ontario, one with black, the other with carob-brown (R) sporangia, but the fruits of both are in clusters. Lister distinguishes three varieties based on the colour and sculpture of the elaters. He has found "the colour of the capillitium and spores is generally associated with a form of elaters of sufficient constancy to enable the specimens to be classed under the above varieties". This is not true for our Canadian collections nor has Macbride recognized the varieties in his American gatherings. Our specimens both have elaters

with long tapering points as typical for the species, but the spirals are continued nearly to the tips as is typical for var. *lateritium*. One has tawny (R) elaters and light-orange-yellow (R) spores typical for var. *lateritium*, the other has ochraceous-buff (R) elaters and spores typical for the type.

On moss and dead wood. Algonquin Park; Rideau Lake.
Nos. 2096, 2261, 2720, 2521T, 2581.

Trichia contorta Rost., Mon., p. 259 (1875) var. inconspicua Lister, Mycetozoa, p. 169. 1894.

The tiny globose sessile crowded Mars-brown (R) sporangia of this species immediately suggest a *Perichaena*, especially when the bright yellow elaters and spores are displayed. The elaters are distinctly and regularly wound with spirals which end in a tapering tip. The sculpture is not obscure, as is said to be the case for the species, and our specimens are undoubteldy *Trichia inconspicua* Rost. described by Macbride, which Lister makes a variety of *T. contorta* Rost. The species *T. contorta* is reported as being very rare in America, and so far there is no record for Canada.

On bark.
No. 2721.

Trichia decipiens Macbr., N. Am. Slime-Moulds, p. 218. 1899.

This is a common species which in habit resembles both *T. varia* Pers. and *Hemitrichia clavata* Rost. The sporangia vary from honey yellow (R) to buckthorn brown (R). They usually are stalked but in a few of our collections sessile sporangia are to be found. The long tapering tips of the elaters are a characteristic feature. They may be forked and sometimes terminate in a tiny hook-like process.

On dead wood and mossy logs. Algonquin Park; Toronto; York Mills; Port Credit; Lambton Mills; Rifle Ranges, Toronto; Ottawa.

Nos. 2098, 2099, 2100, 2205, 2221, 2255, 2670, 2672, 2671, 2523T, 2673, 2722, 2723, 2724, 2580F.C.

Trichia favoginea Pers., Roemer N. Mag. Bot., I: 90. 1794.

The sporangia of this species are closely crowded together on a tough membranous hypothallus, often so close are they to each other that when the elaters and spores have been disseminated there seems to be actual union of the walls. They form an ochraceous mat on the substratum which when the walls break becomes especially conspicuous

by the deep-chrome (R) woolly mass of escaping elaters. In some gatherings the sporangia are globose, in others they are oblong and clavate. The shape is determined by the degree of crowding. There is little variation from the type in the characters of the capillitium and spores. The elaters are smooth in the majority of our specimens but in No. 2103, No. 2324, and No. 2728 they are beset by tiny delicate spines only visible with the highest magnifications of the microscope, and even then appearing like a soft down. The spores are diagnostic and show little if any variation. They are from 13 to 15μ and are reticulated by narrow bands into irregularly-sized meshes usually one or two very large meshes and several smaller ones on a hemisphere. The species is distinguished by its broad elaters.

On dead wood, moss, bark and leaves. Snelgrove; Toronto; Wilcox Lake; Muskoka; Niagara Glen.

Nos. 2103, 2104, 2105, 2311, 2324, 2725, 2726, 2727, 2728, 2524T.

TRICHIA PERSIMILIS Karst., Not. Saellsk. pro Fauna et Flora Feun. Forh., IX: 353. 1868.

This species has deep-ochraceous-yellow (R) small, sessile, globose sporangia crowded on the substratum. The capillitium shows great divergence in the length of the elaters and in the number of spinous processes which beset them. In one gathering, No. 2106, some of the elaters are branched suggesting a *Hemitrichia*-like net-work, and have scarcely any spines. The spores are quite different from any other *Trichia* and show numerous variations. Some are reticulated by very broad flat pitted bands, others are covered with pitted warts which appear like bits of broken pitted bands, and there is rarely a continuous border to the spore.

On dead wood. Toronto; York Mills; Muskoka; Rideau Lake; Niagara Glen.

Nos. 2106, 2172, 2319, 2526T, 2583, 2715, 2716, 2717, 2729.

TRICHIA SCABRA Rost., Mon., p. 258. 1875.

The small sessile globose capucine-yellow (R) sporangia of this species are crowded in small patches on bark or wood. Their iridescent sporangia-walls are a clear pale yellow in transmitted light. Sometimes they are beautifully traced on the inner surface with a semi-circular pattern, sometimes covered by a deposit of finely granular matter and occasionally the pressure of the spores leaves them hexagonally marked. The spirals of the elaters are not as regularly wound as those of *T. affinis* deBary and *T. persimilis* Karst. One gathering, No. 2318, has elaters

that have their spiral bands modified at intervals into single large rings. The spinous processes besetting the elaters may be present or absent. The beautiful reticulate spores make the species unmistakable.

On bark. Algonquin Park; Toronto; Muskoka; Rifle Ranges, Toronto; Niagara Glen; Temagami.

Nos. 2097, 2164, 2318, 2527T, 2528T, 2585, 2674, 2675, 2676, 2677, 2678, 2718, 2719, 2730, 2731, 5024.

Trichia varia Pers., Roemer N. Mag. Bot., I: 90. 1794.

This species occurs in such abundance and the pale ochraceous sporangia are so easily seen that it is one of the first finds of the novice. It is frequently found growing side by side with other myxomycetes, especially *T. scabra* Rost., *T. affinis* deBary, *Hemitrichia Vesparium* Macbr., *H. clavata* Rost., and *Arcyria denudata* Sheldon. Although there is great variation in the habit and appearance of the sporangia, which may be stalked, sessile, or plasmodiocarpous, yet it is the only species whose elaters are marked by two loosely-wound spirals and is, therefore, easily identified. This feature of the elaters is constant but many other variations are exhibited; some are very short, others long; some are peculiarly contorted and have a tendency to branch, others are smooth and regular; some terminate with a curved point, others with swollen clavate ends.

On dead wood and bark. Toronto; Port Credit; York Mills; Niagara Glen; Rifle Ranges, Toronto.

Nos. 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2166, 2181, 2213, 2220, 2281, 2529T, 2582.

Tubifera ferruginosa Gmel., Syst. Nat., p. 1472. 1791.

This species is common and its characteristic features are easily recognized. The aethalia vary in size from round flat ones 1.5 cm. in diameter to large effused oblong ones, 7 cm. long × 5 cm. wide, and in colour from pale or chestnut brown to a dark reddish brown. Fruits with firm walls and closely compacted sporangia which form a level tasselated surface are the most common, but some with thin membranous iridescent walls and fruits only slightly connected with each other are met with. We have one gathering, No. 2335, in which the two kinds are side by side and have evidently come from the same plasmodium.

On bark and dead wood. Toronto; Algonquin Park; Swansea; Caledon; Niagara Glen; Thomasville, Ga.; Temagami.

Nos. 2090, 2091, 2092, 2095, 2167, 2228, 2269, 2295, 2350, 2335, 2734, 2733, 5121.

TUBIFERA STIPITATA (Berk. and Rav.) Macbr., N. A. Slime-Moulds, p. 157. 1899.

We have one good collection of this very interesting and comparatively rare species—collected by Mr. T. Langton in the neighbourhood of Toronto. It may be distinguished at once from *T. ferruginosa* by its sturdy stalks, which are present in all of our plants, 13 in number. The spores are markedly smaller than those of *T. ferruginosa* and serve as a diagnostic feature even in sessile forms. The granular matter on the walls is also much finer and more densely deposited.

On dead birch bark. Toronto.

No. 2214.

LIST OF SPECIES AND VARIETIES.

Amaurochaete fuliginosa Macbr.
Arcyria cinerea (Bull.) Pers.
" denudata Sheldon
" ferruginea Sauter
" globosa Schwein.
" incarnata Pers.
" nutans Grev.
" Oerstedtii Rost.
" pomiformis Rost.
" stipata Lister
" vitellina Phillips
Badhamia foliicola Lister
" lilacina Rost
" magna Peck
" rubiginosa Rost.
" utricularis Berk.
Brefeldia maxima Rost.
Ceratiomyxa arbuscula Berk. and Br.
" fruticulosa (Muell.) Macbr.
" porioides (Alb. and Schw.) Schroeter
Cienkowskia reticulata Rost.
Comatricha elegans Lister
" irregularis Rex
" nigra Schroeter
" " var. aequalis (Pk.) Sturgis
" pulchella Rost.
" typhoides Rost.

Craterium leucocephalum Ditm.
" minutum Fr.
Cribraria argillacea Pers.
" aurantiaca Schrad.
" intricata Schrad.
" var. dictydioides Lister
" languescens Rex
" macrocarpa Schrad.
" purpurea Schrad.
" splendens Pers.
" tenella Schrad.
Diachaea bulbillosa Lister
" leucopoda Rost.
" splendens Pk.
Dictydiaethalium plumbeum Rost.
Dictydium cancellatum Macbr.
Diderma asteroides Lister
" effusum Morg.
" floriforme Pers.
" globosum Pers.
" hemisphericum Horn.
" spumarioides Fr.
" testaceum Pers.
Didymium crustaceum Fr.
" melanospermum (Pers.) Macbr.
" " var. minus Lister
" nigripes Fr.
" " var. eximium Peck
" squamulosum Fr.
Enteridium Rozeanum Wing.
Fuligo cinerea Morg.
" septica Gmel.
Hemitrichia abietina Lister
" clavata Rost.
" Karsteni (Rost.) Lister
" Serpula Rost.
" Vesparium (Batsch.) Macbr.
Lamproderma arcyrionema Rost.
" violaceum Rost.
Leocarpus fragilis Rost.
Lindbladia effusa Rost.
" " var. simplex Rex

Lycogala conicum Pers.
" epidendrum Fr.
" flavo-fuscum Rost.
Mucilago spongiosa Morg.
Oligonema flavidum Peck
Perichaena chryosperma (Currey) Lister
" corticalis (Batsch) Rost.
Physarum auriscalpium Cooke
" cinereum Pers.
" compactum (Wing.) Lister
" compressum Alb. and Schw.
" contextum Pers.
" Diderma Rost.
" flavicomum Berk.
" globuliferum Pers.
" lateritium Morg.
" leucophaeum Fr.
" leucopus Link
" nutans Pers.
" polycephalum Schwein.
" pulchripes Peck
" sinuosum (Bull.) Weinm.
" tenerum Rex
" testaceum Sturgis
" variable Rex var. sessile Lister
" virescens Ditm.
" viride Pers.
" " var. aurantium Lister
Reticularia Lycoperdon Bull.
Stemonitis ferruginea Ehrenb.
" " " var. Smithii Lister
" flavogenita Jahn.
" fusca Roth.
" " var. confluens Lister
" " var. trechispora Torr.
" herbatica Peck
" pallida Wing.
" splendens Rost.
" " var. flaccida Lister

Trichia affinis deBary
" Botrytis Pers.
" contorta Rost.
" decipiens Macbr.
" favoginea Pers.
" persimilis Karst.
" scabra Rost.
" varia Pers.
Tubifera ferruginea Gmel.
" stipitata (Berk. and Rav.) Macbr.

SUMMARY.

1. This paper embodies the results of critical studies of a large number of gatherings of myxomycetes, mainly from Ontario, representing 29 genera and 117 species and varieties. In connection with several species new facts relating to their morphology, physiology and distribution have been observed and in such cases more accurate interpretations were made possible.

2. In all, 28 genera and 110 species and varieties have been reported from Ontario.

3. Forty-seven species and varieties are here recorded from Ontario for the first time; 36 of these are new to Canada.

4. Three species and 2 varieties are here reported as new to North America, namely, *Badhamia foliicola* Lister, *Diachaea bulbillosa* Lister, *Stemonitis fusca* Roth. var. *confluens* Lister, *Stemonitis fusca* Roth. var. *trechispora* Torr., and *Stemonitis flavogenita* Jahn.

5. The plasmodia of two species have been observed for the first time: the plasmodia of *Badhamia magna* Peck, light cadmium (R), and *Physarum pulchripes* Peck, orange.

6. The following have been observed parasitizing fungi: *Badhamia foliicola* Lister, *Badhamia magna* Peck, *Badhamia utricularis* Berk. *Physarum flavicomum* Berk., and *Physarum polycephalum* Schwein. The following nine have been found at times fruiting on the leaves or stems of grasses or herbaceous plants, and in some cases at least are injurious to these plants: *Diachaea leucopoda* Rost., *Diderma effusum* Morg., *Diderma testaceum* Pers., *Didymium squamulosum* Fries, *Fuligo septica* Gmel., *Leocarpus fragilis* Rost., *Mucilago spongiosa* Morg., *Physarum cinereum* Pers., and *Physarum sinuosum* Weinm.

EXPLANATION OF PLATES.

Figs. 1, 2. Clustered sporangia of *Badhamia rubiginosa* Rost., ×75.

Figs. 3, 4. Sporophores of *Ceratiomyxa arbuscula* Berk. and Br., ×75.

Fig. 5*a*. Three elaters of *Oligonema flavidum* Peck. No. 2427 (Univ. of Toronto Herbarium): the third elater is shown in outline only, ×1000.

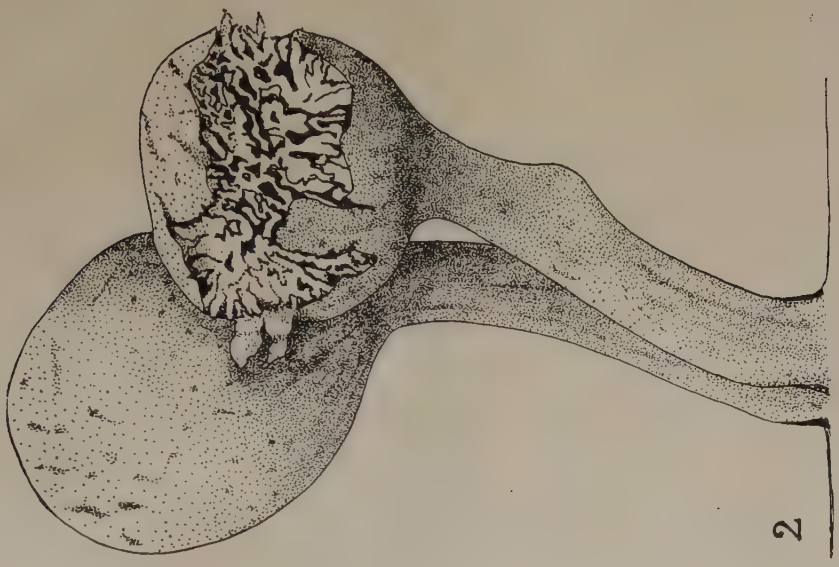
b. Spores from the same collection, ×1000.

Fig. 6*a*. A single elater, detail shown in part only, from No. 2253 (Univ. of Toronto Herbarium), ×1000.

b. Spores from the same collection, ×1000.

Fig. 7*a*. A single elater from No. 2230 (Univ. of Toronto Herbarium), ×1000.

b. Spores of the same collection, ×1000.



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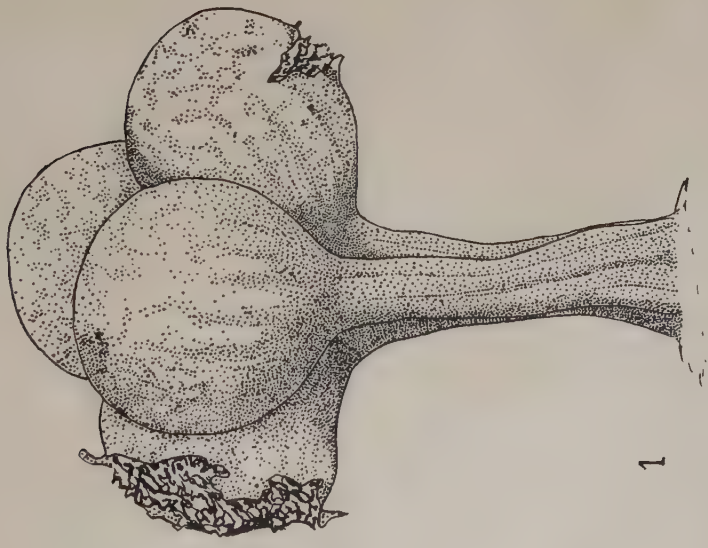

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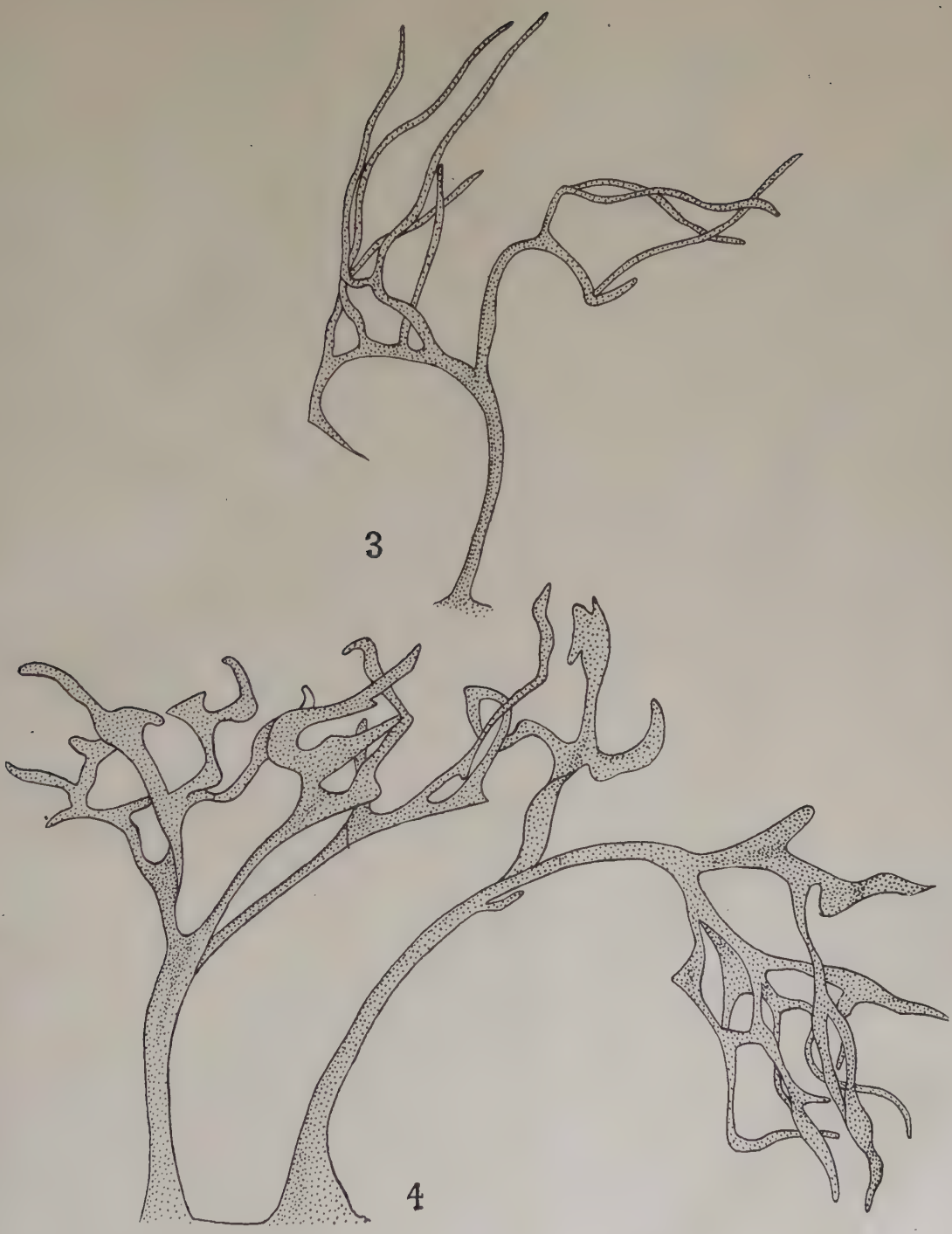
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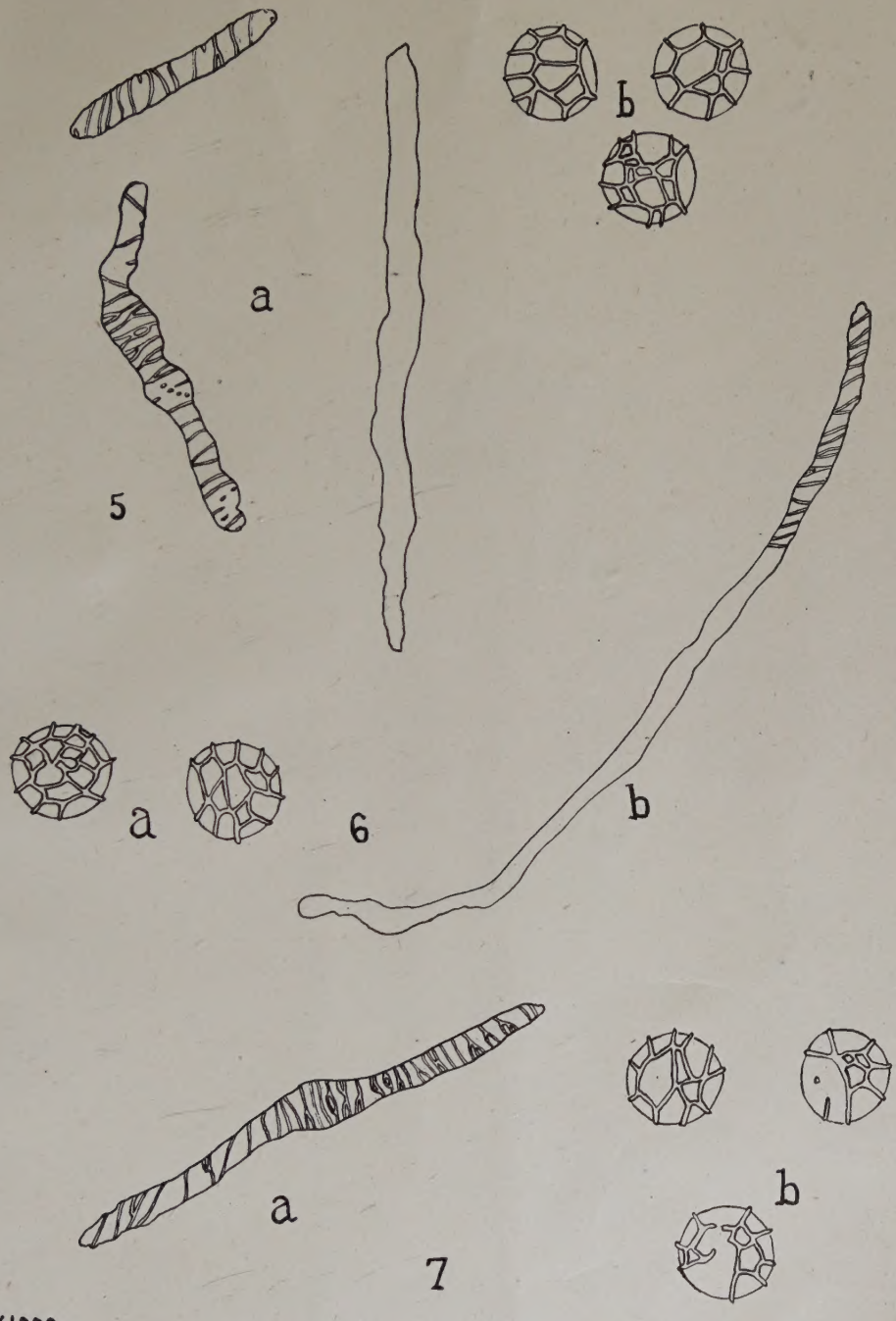
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